KINNAIRD COLLEGE FOR WOMEN, LAHORE

SECURITIZATION OF OUTER SPACE: INDIA'S PURSUIT OF SPACE POWER AND IMPLICATIONS FOR PAKISTAN (1950-2023)

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MPHIL

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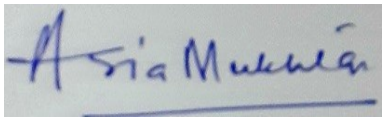

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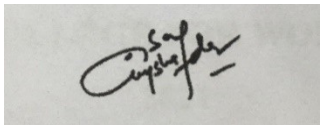

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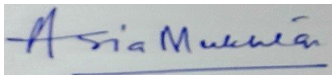

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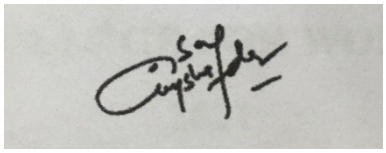

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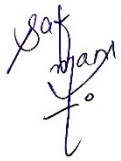

ABSTRACT

Outer-Space security nexus has become and inevitable and palpable phenomenon in 21st century which has surfaced to limelight owing to ever-enhancing military space capabilities of states, space-based and space-related threats, and resultantly the susceptibility of state's space policy to dynamics of securitization in order to pursue space power. This competition for leveraging space for enhancing space power is not limited to major powers, rather has long been proliferated in South Asian Region which has now become more apparent given India's relentless quest for enhancing its space capabilities, particularly in military domain. Ever-enhancing India's military space capabilities have various ramifications for Pakistan from conventional to nuclear domain. In this backdrop, this research aims at highlighting the Outer Space's securitization through analyzing space security policies of key space faring nations such as US, China, Russia, and Japan. In addition, it also underlies the International space law in curbing space arms race in general and with respect to India and Pakistan in particular. Most significantly, this thesis also quantifies the India's space policy coupled with its civil, commercial, and military space program to underlie its space power pursuit driven by various factors. The significance of the research is that it holistically explores various dynamics of Pakistan's space program alongside repercussions of India's space program, particularly, the burgeoning military space capabilities, for Pakistan. Most notably, it suggests the practical policy recommendations given the emanating space-based and space-related security threats for Pakistan. The theoretical framework used is the theory of securitization and theory of space power while the methodology used is qualitative while the type of social research is exploratory. This research concludes that India's space power quest necessitates Pakistan to develop effective national space policy and defensive military measures.

Keywords: *Outer Space, Space's Securitization, India, Pakistan, Nuclear deterrence, warfighting capability, Ballistic Missile Defense, Space Arms Race*

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LIST OF ABBREVIATIONS

AAD-Advanced Air Defense

ASAT-Anti Satellite

CARTOSAT-Cartographic Satellites

COMINT-Communication Intelligence

DSRO-Defense Space Research Organization

EOS-Earth Observation Satellites

GEO-Geostationary Orbit

GSAT- Geostationary Satellites

GSO-Geosynchronous Orbit

HEO-High Elliptical Orbit

INSAT-Indian National Satellite System

IRS-Indian Remote Sensing Satellites

ISRO-Indian Space Research Organization

LEO-Low Earth Orbit

MEO-Medium Earth Orbit

NCA-National Command Authority

PAD-Prithvi Air Defense

PAROS- Prevention of Arms Race in Outer Space

PPWT- Prevention of Placement of Weapons in Outer Space

PSLV-Polar Satellite Launch Vehicle

RISAT-Radar Imaging Satellites

SIGINT-Signal Intelligence

SUPARCO- Pakistan Space and Upper Atmosphere Research Commission

TNT-Tactical Nuclear Weapons

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INTRODUCTION

CHAPTER I

The 21st century is characterized by the incessant aspiration of states to enhance influence and accumulate prowess in military, political, economic, and technological areas which is intrinsically linked with the disquisition of Outer Space for strategic, military, and peaceful purposes in order to fulfill the national security objectives of states. Being as essential medium of power and progress, space faring as well as non-space faring nation comprehend the strategic connotation of space. Resultantly, the use of space for multiple conflicting pretensions has ramifications for global and regional security environment. The space competitions among major powers have caused various actors such as India to enhance their space power which is transforming the geostrategic environment of South Asia and putting Pakistan in disadvantageous position vis-à-vis India.

.Militarization of space dates back to first space age when Soviet Union launched the first artificial satellite Sputnik in 1957, marking the beginning of space arms race between Soviet Union and United States. Both superpowers unfolded their vigorous space programs, primarily in military domain entailing missile warning satellites, hardened communication satellites, navigation and radar imaging satellites and such other state of art space military technologies. Post-Cold War witnessed the re-emergence of space as a cardinal domain of warfare triggered by the China's successful ASAT-Anti Satellite Weapons Tests in 2007. In present times, the space militarization and to some extent weaponization has been intensifying with the involvement of more actors and development of offensive space capabilities. Strategic Support Force of China and Space Force of Russia built in 2015, Space Operations Squadron of Japan, and most importantly US Space Force formed in 2019 imply the inclination of major powers towards the space warfighting capabilities. Various legal space regimes such as Treaty for Outer Space to curb the militarization of space, however, the have proved to be ineffective due to major lacunas in them and their interpretation by states.

The ongoing space arms race has spiral effects, particularly in South Asian where India endeavors for leading-edge space program in order to come at par with major powers. INCOSPAR-The Indian National of Committee for Space Research formed in 1962 officially marked the historical beginning of India's space activities leading to formation of ISRO-India Space Research Organization in 1969. After the technologically advanced civilian space program, India is leaping up its military space capacity through development of military

satellites, ASAT, evolving ballistic missile defense shield for amplifying its offensive and defensive security arrangements. Space organization of Pakistan known as SUPARCO-Space and Upper Atmosphere Research Commission which came into being in 1961 launched the rocket Rehbar-I through collaboration with US Air Force and NASA. However, there is no comparison between the space capabilities of India and Pakistan in contemporary era as India in colossally ahead Pakistan with respect to space explorations. The Space Vision 2047 of Pakistan approved by National Command Authority in 2011 aims at exploiting the space for national security and national well-being. The inability of Pakistan to develop the space technologies are burgeoning the security concerns of Pakistan that are predominantly India-centric.

In the security studies, the Copenhagen School landmark contribution is the theory of Securitization developed by the imminent scholars Ole Waever, Barry Buzan, Jaap de Wilde and other loosely related researchers. Formerly espoused by the Ole Waever, Securitization provided a novel perspective on onerous discourse of 'threat to security' by interlinking the speech act with security, therefore disregarding security as either subjective or objective in nature. For the securitization of issue, determination of existential threats, exceptional countermeasures, and justification of rule-breaking behavior are considered the three pre-requisites. For the social construction of something as a threat, speech act of securitization should have a particular rhetorical structure, extrapolated from historical connotation of defense, threat, urgency, survival and war. In crux, categorization of politicized and non-politicized issue as "security", it is heightened as security issue that must be addressed with exigency. Besides Securitization, Theory of Space Power employed is another significant theoretical framework. Primarily influenced by Collin S. Grey, space power theory explicate the way space forces bring about the strategic effectiveness for winning, influencing, and deterring conflict. Grey particularly focused on the space control which implies the freedom of action in fourth domain of warfare-space as well as its denial to enemy.

As far as Outer Space Securitization is concerned, association of space with the 'Security' has its roots in the Cold War era which has now surfaced to prominence in the 21st century.. Globally, the space policy of various states is progressively susceptible to dynamics of Securitization due to development of Security-Outer Space nexus by policy elites. Additionally, framing of access to space as indispensable for military, environmental, and economic security of international organizations and leading states is accelerating the Securitization process. Besides the major powers, India has now emerged as a key state

involved in the Outer Space's Securitization which has detrimental implications for Pakistan. Concomitantly, the pursuit of space power by US, Russia, China, Japan, European Union, and most importantly India fully resonates with the Outer Space Securitization as these actors deem it crucial for strategic advantage over the adversary. All the developments pose serious security repercussions for the Pakistan given its feeble space program and enhancing counterforce capabilities of arch rival India. Therefore, Pakistan needs to buttress its space program or at least develop low cost space disruptive technologies to ensure its national security.

1.1 SIGNIFICANCE OF STUDY

This research will provide the perspective of Securitization with respect to geopolitical dynamics in Outer Space meanwhile entrenching the vying of Space Power by US, China, Russia, Japan, and most importantly India**.** A holistic perspective on space strategies of key space faring nations would be provided alongside their global implication. Space Program of India, its space strategy, aspirations and impact on region would be assessed. Moreover, this study would help the policy makers in analyzing the implications of India's space power for Pakistan. Moreover, it would suggest the Space Policy for Pakistan in order to curb the emanating security threats from India's enhancing space power.

1.2 PURPOSE AND DESIGN OF THE STUDY

1.2.1 AIMS AND OBJECTIVES

1. To assess the securitization of outer space in the wake of escalating geo-political competition in fourth domain of warfare
2. To understand the International space laws enacted for ensuring space security and to ascertain to what extent these laws are effective in curbing the arms race in space
3. To analyze the evolution of India's space program and ascertain its space aspirations
4. To evaluate Pakistan's space capabilities and to analyze the repercussions of space's militarization by spacefaring nations, particularly India, for Pakistan

1.2.2 RESEARCH QUESTIONS

1. What is Outer Space and how is it connected to geostrategic securitization?
2. What are the major legal frameworks under international law with respect to mitigation of outer space's weaponization?
3. How India's global and regional hegemonic aspirations commensurate with its ever-enhancing civilian and military space capacities?

4. What are the current space capabilities of Pakistan; and how it is being affected by space militarization, particularly by India?

1.3 NATURE OF STUDY

The study is exploratory in nature as it aims at exploring the ramifications of the Outer Space's Securitization and India's relentless quest for space power for Pakistan. This research will be primarily based on the secondary data resources such as books, government reports, journal articles, official websites etc. The duration of study is from 1950's-the initiation of space race till 2023-the intensification of arms race in outer space.

1.4 LITERATURE REVIEW

The literature review is chronological to trace the ever-accelerating complex dynamics of space militarization and weaponization over the years

Caldicott & Eisendrath (2007) in the book chapter assert that the use of space for military purposes occurred concomitantly to, and as an offshoot of defense system for missiles. Later in 1997, the US Space Command presented "Vision for 2020" enshrining the Full Spectrum Dominance strategy which serves as the premises of space weapons. Further in 2001, the notion of 'Space Pearl Harbor' in the report given by congressionally mandated mission came forward urging the US government to vigorously develop space capabilities in order to deter possible attack on space systems of US. As per the author, satellite-directed warfare remains the key motive for US to develop aggressive means for decimating the capacity of rival states; and China serves as major putative adversary in outer space. However, the author argues that given the military superiority of United States, a shift from its bellicose to diplomatic stance is essential for devising the agreements.

Moltz (2011) in his book chapter highlights the contrast between the first space age during the Cold war and the second space age initiated after development of human spaceflight capabilities of China in 2003. Factors such as multi-polarity, lack of arms control-process in the wake of new military space threats, economic globalization, and bulk of scientific knowledge provide a conducive environment for increased space competition and cooperation. The second space age witnessed the surfacing of various space powers in Asian region such as China, South Korea, Japan, and India; while there are other states like Pakistan, Australia, Indonesia, and Malaysia having significant plans for space explorations. The author regards scientific-technical progress, national security, and international prestige as the key motivations behind

their space programs. The author also asserts that neoliberal analysts posit that space cooperation in Asia might occur while the power-based theorists negate the prospects of cooperation. In the end the author foregrounds the future pitfall of inability to curb space competition prior to its emergence as space conflict.

Does (2013) in her book discusses the immense contributions of Copenhagen School of Thought to theory of Securitization. Originally formulated by Ole Waever, and later extended by Barry Buzan and De Wilde along with Waever, the securitization theory emphasizes the framing of the particular issue as a potent security question through process known as act of securitization. Moreover, it entails articulation of politicized problem as existential danger to security's referent object. The author also highlighted the two fundamental forms of Securitization i.e., sociological and philosophical, former equates speech act with security while latter considers securitization as pragmatic process. The author also highlighted the criticism Securitization theory receives because of being bounded and its substantial emphasis on speech act.

Minhas & Shujahi (2017) in their article believe that the strategic environment of South Asia revolves around security dilemma and threat perception between Pakistan and India. He asserts that modernization of armed forces is eroding the deterrence stability which is pre requisite of strategic stability. He accents the membership of India to Australia Group, Wassenaar Arrangement, and Missile Control Technology Regime which could enormously expedite its space weapons aspirations and Ballistic Missile Defense Program, therefore crumbling the region's strategic stability. The author concludes that space weapons coupled with the BMD shield of India also has the potential to kick off the arm race in region.

Khan and Khan (2019) in their article discuss the security trilemma in the fourth domain of warfare-space in volatile region of South Asia that in turn has been created due to Sino-US geopolitical competition in space. The developments in space have substantially affected the region's power structure, particularly between Pakistan and India on one hand, and India and China on the other. In order to enhance the national power at national as well as international levels, both China and India are advancing their space capabilities. Being a key regional actor, Pakistan cannot disregard technological developments in space, which are considered to shape the future power hierarchy in world in general and South Asia in particular. United States being a hegemon in space influences the geopolitical dynamics in South Asia by alchemizing

Regional Security Complex of region into perilous ‘super security complex’, thus spurring space security trilemma for China, India, and Pakistan.

Bernat (2019) in article states that for the operability of strategically significant satellite systems, states are carryout the programs aimed at development of defensive and offensive systems for various objects in orbit which in turn has kicked off creation of countermeasure weapons. Resultantly, space has emerged as an arena of potential conflict and the condition seems to aggravate further due to ineffectiveness of current treaties and laws of outer space and UNOOSA-United Nations and its Office for Outer Space. The author asserts that the ever-accelerating reliance on orbital navigation, communication, and security systems has made militarization of space inevitable. The democratization of lethal weapon systems such as Anti-Satellite Weapon systems coupled with the development of ground-based lasers, cyber hacking, and small kamikaze satellites are colossal risk for the satellite systems.

Lele (2019) in his article examines the disadvantageous position of India vis-à-vis China due to latter’s military preparation, thus compounding the security dilemma between both states. The author states that this security dilemma has the probability to penetrate the crucial strategic sectors such as space. The issues related to space security came to limelight in 2007 when China conducted its anti-satellite test; and now its space technology proficiency, expanse of space programs, financial investments, and future plans are incessantly advancing which largely transcends the India’s space capabilities. However, India has launched communications satellites, principally for Indian Navy and Indian Air Force, alongside the Earth observing satellites for strategic purpose of ensuring nuclear deterrence’s credibility, primarily against the China.

Goswami (2022) in report explores the three factors propelling the space program of India. The first factor nationalism is based on the strengthening the nation building, ensuring the legitimacy of regimes, boosting the external status, and lastly the internal national development. The second factor entrepreneurship with a motive to extract profit from space and third factor national security for various military purposes given the missile development of Pakistan and space infrastructure of China also play an indispensable role in this regard. The author further states that previously the space capacities of India were restricted to civilian and military domain but now they are expanding in the commercial sector. In the end author highlights that the contribution of India to global space economy may increase from 2% to 9% by 2030 which will considerably lure the global space manufacturer.

THEORETICAL FRAMEWORK: OUTER SPACE'S SECURITIZATION

CHAPTER II

2.1 INTRODUCTION

Securitization of Space has its origin in nuclear arms race between US and USSR following the devastating Second World War. Given the horrendous impact of nuclear weapons at the termination of World War II coupled with the development of nukes by both superpower US and UUSR, quest for technological superiority began between both states. Resultantly, the competition in nuclear domain and space domain erupted simultaneously. Aided by various German scientists, both superpowers started to develop rocket technology and gradually Intercontinental Ballistic Missiles in order to deliver nuclear weapons over colossal distances in less time, thus shaping the space program of US and USSR and making outer space an important domain in the security studies. The requirement of rockets by both these states to attain certain velocities and altitudes for precise delivery of warheads around the world is rudimentary to origin of space program and use of space capabilities for security purposes.

In 1957, the USSR launched the first artificial satellite named Sputnik, formally kicking off the space age. In the subsequent year, the US also launched its own artificial satellite named Explorer to match its ideological rival US. Gradually, groundbreaking efforts from both sides led to launch of multiple artificial satellites, human space voyages, space probes in Mars, Venus, and Moon and other lunar missions. In the late decades of 20th century, other states such as UK, China and Japan followed the course and joined US and UUSR in this competition States began to use space of space military applications such as surveillance, navigation, positioning, imagery, tracking and communication. The proliferation of actors' number and ever-enhancing interdependence between commercial, civil, and military space sectors has made space a contested environment. It has been regarded as war fighting domain and hence states have securitized it in order to ensure their security and enhance military space capabilities, avert threats, and protect space-based assets and ground-based assets by enacting space policies, developing space forces, enhancing military budget and developing state-of-the-art space-related technologies. This space's securitization is intended to accrue space power which the space faring state consider indispensable for enhancing their national prowess and ensuring national security.

In this backdrop, this chapter discusses a) theory of securitization; b) theory of space power; c) nexus between both these theories; d) space power and securitization with respect to outer space by underlying space security policies of US, Russia, China, and Japan.

2.2 OUTER SPACE

Outer Space is expanse/ zone above as well as around earth. It is dark vacuum and devoid of air. According to the International Law, outer space or shortly space shall be used by all and declared it to be free for exploration purposes. However, there is no exact definition of outer space and no law enshrining the ending of national airspace and beginning of outer space, leading to the different interpretations. Mostly, 'Karman Line', named after Theodore von Karman, is used as a parameter to define space. This line is an imaginary boundary which differentiates and outer sphere from earth, to be approximately 80km (or 50 miles) above sea level. In present times, Karman line is considered to be 100km (or 62 miles) above sea level as per the National Oceanographic and Atmospheric Administration. NASA and US military definition differ as outer space is 50 miles above surface of earth which is 12 miles below the proposed Karman Line. Karman line has been used to determine the point where the aerodynamic forces become less important and earth's atmosphere becomes thin and traditional aircraft remain unable to maintain flight. At this point, the orbital dynamic forces are important suggesting need of a propulsion system non-reliant on lift produced by atmosphere of earth in order to reach orbital velocity to maintain flight of vessel (Drake, 2018).

2.3 TYPES OF ORBITS

In order to understand outer space, it is essential to categorize orbits in which space systems or satellites are placed. Orbit is the repeating and regular path in space taken by the object around one another.

2.3.1 LEO-LOW EARTH ORBIT

The altitude of Low Earth Orbit (distance from surface of Earth) ranges from 180km to 2,000km, LEO is relatively proximal to surface of Earth. LEO is primarily used for remote sensing and communication satellite systems, Hubble Space Telescope, Human spaceflight and International Space Station, and Information Surveillance and Reconnaissance (ESA, 2023)

2.3.2 MEO-MEDIUM EARTH ORBIT

The orbits existing between LEO and GEO-Geostationary Orbit fall under the category of Medium Earth Orbit. With an altitude ranging from 2000 to 35, 780 km, the MEO are ideal for communications, timing, positioning, and most importantly navigation

2.3.3 GEO- GEOSTATIONARY ORBIT AND GSO-GEOSYNCHRONOUS ORBIT

The orbital speed of the objects placed in geosynchronous orbit resonates with the rotation of Earth. The altitude of GSO is either equals to or greater than 35,780km making it useful for ISR, Communications, monitoring weather, and missile warning. Geostationary orbits are the types of Geosynchronous orbits, but the difference is they only orbit equator of earth and uses for earth observation and telecommunication.

2.3.4 HEO- HIGH ELLIPTICAL ORBIT

Being an oblong orbit, the altitude of HEO at the point nearest to earth (also known as perigee) is similar to LEO, while at the point farthest from earth (named as apogee) is 40,000km. Its applications include missile warning, communications, remote sensing, satellite radio, and ISR. (ESA, 2023)

2.4 THEORY OF SECURITIZATION

2.4.1 COPENHAGEN SCHOOL AND SECURITIZATION

The Copenhagen School, based in COPRI-Conflict and Peace Research Institute, Copenhagen is credited for the theory of Securitization. The clearest and fully developed expression of this theory is present in the collective landmark work of Ole Waever, Barry Buzan, and Jaap de Wilde which surfaced in 1998 known as ‘Security: A New Framework for Analysis’; however, antecedents can be traced back to People, States, and Fear (1993) by Barry Buzan and ‘Securitization and Desecuritization’ authored by Ole Waever and published in 1995. Other earlier reflection can be seen in David A. Baldwin’s article released in 1997 titled ‘Concepts of Security’ alongside several unpublished manuscripts entailing ‘Security, the Speech Act’ penned by Ole Waever. Meanwhile, the second generation scholars of Securitization such as Thierry Balzacq, Juha A. Vuori, Holger Strizel, and Rita Floyd have elucidated the theory and applied it to distinct discerned security issues spanning from environment and migration to cyber threats (Strilzel, 2014).

2.4.2 COPENHAGEN SCHOOL APPROACH TO 'SECURITY'

Narrow vs broad discourse with respect to conception of security during 1970s-1980s engendered various discrete methods of interpreting security in which CS successfully carved out a middle path by retorting to traditionalist solicitude of 'transformation of everything into security issue' through their development of lucid perception of 'what exactly is security'? Three key elements underlie the CS outlook of security

1. Formation of sectors approach to analyze security, through which threats are discerned in unique and interrelated sectors such as military, economic, environment, political, and social.
2. CS developed a regional lens with respect to security studies, by virtue of which regional security dynamics were examined, questioning the previous state level focus.
3. Most importantly, CS conceived the social constructivist theoretical framework to fathom security through articulation of 'Securitization studies' (Charrett, 2009).

Copenhagen school conventionally relies upon the military lens to define international security. Barry Buzan equated security with survival which implies any issue is staged as constituting an existential threat to a selected referent object, primarily but not essentially state. Moreover, the multisectoral security framework of CS in contrast to traditionalist monosectoral approach signify their attempt to enlarge the security paradigm beyond military sector which in turn allows the determination of referent objects other than state, such as national economies, national sovereignty, habitats and species, and collective identities highlighting the new conceptions of economic, political, environmental, and cultural security respectively (Does, 2013).

Copenhagen School emphasizes to peruse the security in terms of 'state of exception' suggesting the existential nature of security threats to designated referent objects including state/territory/populace, culture/identity, financial systems/market, biosphere/environment, and social order/organizational ability. Correspondingly, security is identified apropos of distinct modality characterized by extreme urgency, supreme priority to take an action, and norm breaking behavior. Securitization process enables dramatization of an issue as a concern of utmost priority, allowing the agent to highlight the need to take security issue beyond normal political procedures and roles and unroll discussion to employ 'extraordinary measures' to treat it (Strilzel, 2014).

2.4.3 DEFINING SECURITIZATION

Securitization is defined as intersubjective establishment of a threat having existential nature, which warrants immediate and urgent attention, coupled with employment of exceptional measures to oppugn the threat (Charrett, 2009). Here the term intersubjective establishment refers to 'between securitizing actor and targeted audience'. Securitization refers to the process whereby certain issues emerge as security analysis's referent object. Securitization is centered on assumption that reality is socially constructed. This theory suggest issues become integral to security agenda when labelled as security or securitized. It implies that all issues are those that are characterized with security importance during social construction; moreover, they are not incorporated in security agenda for either being universal or universal threats, rather due to matter that they are framed by people who handle these issues in conformity with meaning they associate to them.

The securitization steps is based on the three fundamental steps

1. Recognition of existential threat to a referent object
2. Emergency measures
3. Impact on inter-unit relations (security act occurs internally within units-between audience and securitizer) by overriding rules

Securitization theory emerged in response to necessity to broaden the scope of security studies in the post-Cold War era. It provides conceptually cogent modus operandi for analyzing security as an outcome of explicit socio-political discourses as well as practices. Securitization theory while keeping into consideration lucid understanding of nature of security delves into various questions such as who is securitizing an issue; what are the issues or threats? what are the conditions under which securitization process takes place?; For whom is it taking place (referent objects being threatened), why and what are outcomes of this process? (Charrett, 2009).

Being an advocate of Sociological Approach of Securitization, Thierry Balzacq puts forward the three fundamental postulated enumerated below

1. **Essentiality of audience:** It is indispensable for an empowering audience to accede to the claims formulated by securitizing actor in order to securitize an issue. Here the term empowering audience refers to audience having immediate causal link with issue alongside ability to allow securitizing actor to address threat by adopting extraordinary

measures. In crux, to fulfill the securitization process, the empowering audience must approve the securitizing move.

2. **Agency-Context co-dependency:** Semantic repository of security is based on cultural meaning and textual meaning. The former refers to knowledge acquired through past interactions and contemporary state of affairs while the latter implies knowledge of concept gained through spoken and written language. It can be asserted that performative aspect of security lies between contextual circumstances and semantic regularity. Balzacq insists that security statements shall be in conformity with external reality to win an audience; on the contrary, the Copenhagen School assert that security's concept alters the context through successful implementation of constitutive rules of illocutionary speech act.
3. **Significance of dispositive and practices**: This assumption suggest that securitization takes place in field of effort and competition. Consequently, it's comprised of various practices which epitomize intersubjective settlement and are constructed by tools as well as habitus derived from various social fields. The role of dispositive is to interlink the practices (Balzacq, 2011).

2.4.4 SECURITY: AN ILLOCUTIONARY ACT OF SPEECH

The theoretical debate on security raises one of the most significant question i.e. What constitute a security problem? According to Waever, security problems represent occurrences that imperil the independence or sovereignty of state in a specifically dramatic manner, and divest of its capability to manage on its own. These kind of threats undermine the political order and therefore should be dealt with mobilization of utmost resources and effort. In operational sense, this denote: In labelling specific happening a security problem, a special right can be claimed by the state that in turn is forever outlined by the state alongside the ruling elites.

By taking into consideration the aforementioned arguments, it can be said that something transforms into a security problem when the ruling elites proclaim it to be. This leads to another very crucial question of 'What is security? Ole Waever has again defined security in accordance with the language theory — Security is a speech act — this definition doesn't suggest security as an emblem that regards something more authentic, rather equates utterance with an act. Resultantly, something is done when someone says it (as in naming a ship, giving a promise, betting). State-representative shifts a key issue or occurrence into distinguished area by uttering security; ergo, assert exclusive right to harness all means essential to curb it

Securitization scholars consider security as an illocutionary speech act. The term illocutionary can be understood by using the Austin's perspective on types of acts conveyed through the sentence. Overall speech act situation is blend of the below mentioned acts:

a) **Locutionary:** It means the expression's utterance entailing given sense as well as reference
b) **Illocutionary**: implies the act carried out in enunciating the locution. This class of speech act adequately encapsulates the certain performative class of saying something, making speech act based on this type of agency.
c) **Perlocutionary**: Sequels or consequential effects that are directed to evoke beliefs, feelings, actions, or thoughts of the audience (Balzacq, 2011).

Jurgen Habermas also explains the triadic characterization of types of acts whereby he considers locutionary means to say something; illocutionary to act in uttering something; and lastly perlocutionary to achieve something by means of acting in uttering in something

2.4.5 UNITS WITH RESPECT TO SECURITY ANALYSIS

Speech-act perspective of security necessitates the differentiation between three basic units essential to security analysis: a) Referent object; b) Securitizing actors; and c) functional actors.

a) Referent object: Reference objects are existentially threatened things or entities having the licit claim to survival. As Copenhagen School connotes security with survival, it implies representation of an issue a matter of referent object's survival which can be regarded as utmost necessity. The cardinal principal is identical to the conventional focus of defense and national security: war is a threat to the survival of key referent object – the state which makes it essential for state to keep up standing armies, intelligence agencies, procure and produce weapons, and the list goes on. Traditionally, the referent object remains the state but the securitization approach allows the broader spectrum of opportunities as vulnerabilities and threats that can emanate in military and non-military sectors. However, the security issues must rigorously fulfil the defined criteria differentiating them for ordinary politics. It is imperative for securitizing actor has to present these issues as existential threats to designated referent object that can allow him to seek support in carrying out emergency measures transcending the established rules (Buzan, Waever, & Wilde, 1998).

b) Securitizing actor: Securitizing actors are defined as individuals and groups who carry out security speech act (the actors securitizing the security issues). These actors can be

political leaders, governments, bureaucracies, pressure groups, and lobbyists; howbeit, they aren't generally referent objects by themselves, because these actors can speak security by making references to shielding their very own survival in only rare circumstances. Normally, the arguments of securitizing actors are that it is mandatory to preserve security of nation, state, some larger community, civilization, systems, or a principle. Securitizing actors such as firms or government can only make successful references to their security in occasional circumstances.

c) **Functional actors:** Functional actors neither falls under the category of securitizing actors that make security claims on account of referent objects nor the referent objects themselves, rather players who impact sectoral dynamics and considerably affect decisions in security field. An example can be cited of a polluting company considered as a chief player in environmental actor, which is not securitizing issues of environment and not referent object being threatened (Buzan, Waever, & Wilde, 1998).

2.4.6 SECURITIZATION'S FACILITATING CONDITIONS AND CONTEXT

In order for securitization to be successful, there are certain conditions which act as the decisive factors enabling the securitization move to function properly and get audience approval. Successful speech act is predicated on amalgamation of society and language, entailing intrinsic attributes of speech coupled with the group that recognizes and sanctions that speech.

The Copenhagen School has summarized conditions facilitating the securitization process that are listed below

1. Grammatical and linguistic form which regulates the manner in which speech act is executed and an existential threat is presented. These conditions are also known as internal conditions.
2. Position of authority or influence for securitization actor — association between audience and speaker that can increase the likelihood of acceptance of speaker's claims presented in speech act. These conditions are known as social, contextual, and external conditions.
3. Characteristics of declared threats that either hinder or further securitization. References of threatening objects such as hostile sentiments, tanks, and polluted waters increase the probability to invoke a security threat (Buzan, Waever, and Wilde, 1998)

Other scholars such as Balzacq, Wilkonson, and Salter have also tried to define the preconditions and context of securitization. There is always a certain dispositive possessed by securitizing actor to securitize something implying the existence of context during securitizing act which are further facilitated by preconditions that can impact the triumph of securitizing move. According to Balzacq, preconditions such as capacity and regulatory tools have a substantial influence over securitizing move, whereby capacity tools refer to material as well as non-material resources, namely training and information; while regulatory tools contain instruments of policy such as laws, programs, etc. As far as context of securitization is concerned, there are two types of context according to Wilkinson: a) proximate context or micro-environment and b) distal context or macro-environment. The former indicates the questions of who (securitizing actor), what (is securitized), and when (is securitized), while the latter outlines questions of how and why pertinent to securitization. Salter has defined proximate context as primary characteristics of interaction, genre in which and stage on which securitizing move is carried out alongside audience and their response towards that move. Whereas, Wilkinson distal context equivalent to macro-environment includes cultural and regional settings, sites of discourse, ethnicity and social class, and political system of a state in which securitization occurs (Raymann, 2014).

2.4.7 TARGETED AUDIENCE

Role of audience hold crucial significance in securitization theory given its fundamental assumption that process of securitization is ‘intersubjective’ to be contingent on audience approval. Barry Buzan states that audience assent makes an issue securitized. Peculiarly, however, the initial development of theory doesn’t pay enough heed in developing the concept of audience. Copenhagen School describes audience as those whom are targeted by securitizing act for persuading them to give assent regarding exceptional measures due to peculiar security aspect of issues. The radical underdevelopment of audience as concept has led Leonard and Kaunert to take insights from ‘three streams model’-a public policy model of Kingdon and incorporate into securitization theory. This allows to discern different audiences, their respective influence on securitization move, and relation between various audiences alongside their impact on policy development in the wake of threat. But, the multiplicity of audiences shouldn’t impede scholars to ferret out ‘enabling audience’, which implies the audience that eventually entitles appropriate authority or securitizing actor to act. This approach to study the role of audience suggests that although various audiences play a part on securitization of

something, it's to-a-degree disparate way than initially conceptualized (Balzacq, Léonard, & Ruzicka, 2016).

The securitizing actor carries out the securitizing move which is always directed against audience that makes the support of audience quintessential for successful securitizing move. Moreover, it's not possible for securitizing actors to take exceptional measures to defend a reference object. To put differently, securitizing actor is obligatory to coax audience for configuring a security issue as potent threat to acquire sanction to get exceptional measures otherwise impossible to take in ordinary political affairs.

Besides authorizing a securitizing move, audience can also perform two distinct functions: firstly, giving moral support; secondly, providing securitizing actor a formal mandate (for example vote by legislature), which is indispensable for policy making to address a security threat. For example, British Prime Minister Tony Blair secured the formal consent of Parliament (one audience) but failed to earn moral support of people (another audience), suggesting the possibility of threat prevalence in society without categorical approval of audience. The formal or informal consent of entire audience is not a requirement in securitization; nonetheless, the key prerequisite is approval of critical mass or enough audience, a fusion of quality and volume. In democratic state, the audience is usually comprised of citizens and elites, while in non-democratic state the governmental elite normally constitute the audience. General public give moral or informal support while parliamentarians or policy makers give the formal support in securitization process. (Balzacq, Léonard, & Ruzicka, 2016).

2.4.8 SECURITIZING MOVE

A security issue moves along the securitization spectrum commencing from speech act, more particularly securitizing speech act is termed as securitizing move which takes place when a securitizing actors speaks of formerly unconsidered security threat.

Securitizing move is considered as initial stride towards securitization. It is essential to expound securitizing move in theoretical and practical aspects. In theory, it suggest that securitizing move is an option available to units of security considering that case of securitization can be identified only when securitizing actor establishes inter-unit relations or convinces an audience of legitimate requirement to act in emergency mode (or break the binding norms). While in practical situation, securitization is rarely unclose to units as well as their subjective view of security threats; nay, it is predominantly predicated on capability, power, and connected with means to politically and socially excogitate a threat. In this manner,

study of security continues to be a broad paradigm, but with limitations concerning who can securitize an issue isn't incoherent and unmanageable. Having said that it is important to note that Ole Waever is immensely opposed to framing issues in context of security as he views security in negative connotation, consequent of failure to resolve an issue through normal political affairs. Resultantly, Waever advocates desecuritization strategy by means of which securitization is reverted, issues are segregated from modality of threat-defense and placed into normal public sphere paving the way to deal with them as per the rules and regulations of democratic political system (Taureck, 2006).

Securitizing move always pertain to a particular referent object as the ultimate goal of a securitizing actor to protect it. The maiden securitization theory articulated by Buzan and Waever identified securitizing act as acts of speech with the central belief that by describing something as security issue constitutes the initial step to enforce extraordinary means. Actors having ample societal influence have the ability to propagate securitizing speech acts. Public addresses or speeches of actors (such as politicians) have considerable impact on security politics; besides, the publications of scientists and institutions are scrutinized in this context. Copenhagen School understanding of speech act goes beyond than mere delineation of reality, rather is one of the most important means of power that can actualize a special task. On the contrary, sociological approach theorists such as Balzacq believe that might of words is grounded on various things: a) power position of securitizing actor who utter words and context; b) relative credibility of utterance for which concurrence of audience is solicited; and c) display of discursive strategy, the way of presenting securitization case (Raymann, 2014).

2.4.9 INSTRUMENTS, TOOLS, AND PRACTICES

The scholars of securitization have retrieved the concepts of 'habitus' and 'practices' from Pierre Bourdieu and 'dispositif' from Michael Foucault.

First it is imperative to understand the concept of field which scholars widely use to propagate practice-centered exegesis of securitization. In a particular field, the identification of agents is based on nature, position with respect to one another, as well as the resources giving them power also named as capital which is further divided into bureaucratic, symbolic, economic, and cultural. Field's members with common interests, similar yet unique way of producing knowledge (regarding threats, in terms of security), coupled with mutual strategies to deal with problems. Thus, it can be said that field engender regimes of practices or more particularly securitizing practices whose context and form are attributable to power relations representing a

field. Here practices refer to actions resultant of relationship between field, capital, and habitus. As far as habitus is concerned, it signifies system of enduring systems and behaviors of agents populating a particular field. It clearly signifies the compatibility of practice-oriented perspective of securitization with the linguistic occurrences. Habitus in theory of securitization underscore struggles inherent to metamorphose linguistic as well as non-linguistic routine that fabricate and buttress the insecurity realm (Balzacq, Léonard, & Ruzicka, 2016).

To understand, instruments, it's important to deconstruct the concept of 'dispositif. Foucalt defines dispositif as sundry ensemble entailing institutions, discourses, regulatory decisions, architectural forms, laws, scientific statements, administrative measures, philanthropic, moral, and philosophical propositions and so on. It denote system of relations constitutes between above mentioned elements. (Foucault, 1980). The scholars of practice approach emphasis on tools and instruments that are employed during securitization of an issue. Depicting a distinct security relations, instruments characterize mental attitude of security agents and thereupon arrange the arrange interplay among members of insecurity's field. Instrument being the part of dispositif are central to securitization processes due to their ability to routinize the practices. This approach certainly possess the deep connection with analytics of government as they give importance to mechanism, instrumentalities, and techniques by virtue of which practices operate and even enacted.

Practices are intrinsically connected to two key : a) regulatory instruments; and b) capacity tools. Regulatory instruments intent to impact behavior of different social actors through different ways: by sanctioning specific practices to diminish the threat; by interdicting those political engagements which are changed into menace; and lastly by encouraging some perception of threat. They attempt to normalize individual's behavior and include constitutions, policy regulations, etc.)Additionally, Regulatory instruments dispense framework for capacity tools to operate. Capacity tools suggest enablement's skills that permit agencies, groups, and individuals to synthesize any decision and perform various activities posing adequate prospects of success. Regulatory instruments are interlinked with procedures of governmentality whereas capacity tools signify particular modalities to external discipline on groups and individuals. The list includes training force, personal and non-personal information, and resources essential to achieve purposes of policy (such as nuclear weapons) (Balzacq, 2011).

2.4.10 MODEL OF SECURITIZATION

Copenhagen School has formed spectrum along which security issues can be placed. The plotting of the issues along the spectrum ranges from politicized to non-politicized and ends at securitized.

- ➢ Non-politicized issue is not a part of public discourse and requires no action from state to deal with it.
- ➢ An issue becomes politicized when it becomes an important element of public policy, necessitating decision and allocation of resources by the government or, in rare circumstances, any other kind of communal governance.
- ➢ An issue can be labelled as securitized when the emergency measures beyond ordinary political procedures of state become the key requirement (Emmers, 2013).

According to CS, act of securitization makes a concern securitized — formulated as potent security issue. Securitizing actor such as political elite, government, civil society, and military presents politicized issue as lethal-cum-existential threat to a particular referent object (for example national sovereignty, state, ideology groups, and economy). Resultantly, the securitizing actor claims to espouse extraordinary measures transcending the normal political procedures to curb the existential threat. Therefore, the Copenhagen scholars see securitization as an act whereby politics surmounts the established game rules and presents security issue either above politics or distinct kind of politics. It implies securitization as extreme form of politicization. Additionally, the securitization process can be reversed when security issues move out of extreme mode and enters the ordinary bargaining processes of political domain.

The process of securitization as per the CS is two-staged which is essential to describe how and when a particular issue should be discerned and worked upon in terms of existential threat. The two-staged process is as follow

1. Portrayal of entities, persons, or issues as existential threats to the designated reference object. Both state and non-state actors (Popular movements, trade unions, etc) can initiated the initial securitizing move; however, powerful players enjoying privileged positions dominates securitization process.
2. The second stage is considered as the critical stage in which securitizing actors achieves the task of convincing the audience (military officers, public opinion, elites, and politicians) that a referent object is endangered by an existential threat. The acceptance

of existential threat to security can thus makes the possibility to impose extraordinary measures (Emmers, 2013).

2.4.11 FORMS OF SECURITIZATION

1. **Philosophical Securitization:** In philosophical securitization, enormous importance is given in securitization process to the persuasiveness and strength of speech act which holds a key usage in constructing the reality. This view is central to the CS outlook of securitization and is grounded on power of language as well as central assumption that 'something is done by saying it', hence identifying speech act with security (Does, 2013).
2. **Sociological Securitization:** As per sociological securitization, web of practices in a particular context holds the prime importance in securitization process. This approach doesn't negate the pertinence of speech act, nay attempt to underlie that speech act has effect over its targeted audience which is more significance in comparison to the act itself. It means that sociological securitization emphasis on practice of formation of/in security coupled with context in which practice occurs. It is viewed as pragmatic and strategic process deeply entrenched with context, practices, audience's disposition, and power relations representing the formation of threat images. Sociological securitization also entail the visual securitization in which process of securitization takes place through the visual act i.e. when an image turns into something or something posing threat to which/ who need immediate protection from (Does, 2013).

Thierry Balzacq is the key proponent of this school of thought who argues that securitization has a broader reality which transcends the speech act. According to him securitization is practice and its nature can be either linguistic or non-linguistic; non-linguistic aspect of securitization doesn't refute the linguistic version rather embody its various characteristics.

2.5 THEORY OF SPACE POWER

Concept of space power dates back to 1960s when various writings mentioned this term amidst the relentless space explorations, however it wasn't defined until 1988 when David Lupton formally defined the space power in his work 'On Space Warfare: A Space Power Doctrine'. According to him, Space Power refers to nation's ability to harness space environment in quest of national purposes and goals and entails absolute astronautical potential of nation. Moreover, Lupton asserted that nation possessing such capabilities is also termed as space power (Lupton, D.E. (1988)

Various experts have contributed towards the space power theory that can be divided into three school of thoughts

2.5.1 CLASSICAL SCHOOL

John Klein used the strategic analogy to propose his theory of space. He adopted principles of Julian Corbett maritime strategy and applied it to realm of space. He favored command of space which he defined as ability of state to access and employ celestial lines of communication in order to buttress military, information, economic and diplomatic instruments of national power. He argues that command of space is based on three pillars: 1) Presence- more or less assets in outer space; 2) Coercion- short of direct conflict but consequent of explicit and implicit threat of inimical actions; and 3) Force- in case of direct conflict, command through force occurs which can be acquired through protecting celestial lines of communication of one's own and simultaneously denying these lines to adversary (Townsend, 2019).

Various space power theorists have extended the theories of land, air, and sea power to the domain of space. The most eminent proponent of Space theory Collin Grey contribution to space theory reflects the Clausewitzian approach: Distinctive features of space are essential to fulfil policy ends; Space forces have the potential to amplify military prowess to detect, harass, and threaten and impair the centres of gravity; Just war tradition, entailing the principle of proportionality, pertain to space power; Just like other types of military activity, 'decisive points' are applicable to realm of space; Space power alleviate the war's fog and friction, however is conditioned with these forces; Defense is rigorous form of war for medium (800-35,000km) and high (exceeding 35,000km) orbit of Earth, though unsuitable in low (150-800km) orbit of Earth; 'Essential team player' is synonymous with space power as it will presumably evolve into most valued team player in present century. Grey asserts that airpower and sea power theories provide various essentials of space power. Example can be cited of idea of space blockade emanated from naval origins, while concept of space control is derived from air and sea power theorists (Berkowitz, 2021).

Martin France has used the Mahanian approach to advance the work on space power. He applied conditions of sea power (physical conformation, geography, size of population, extent of territory, character of government and people) alongside elements (fleet, bases, and position) to field of space. As per this approach, space power is based on geography, character, and national capabilities. Athwart, John Fox draws analogy between near-term space power and Corbettian joint-arms concept, contradictory to Mahan's dominant sea power notion.

Moreover, Fox argues that space control is parallel to the local and temporary control of chokepoints and ports advanced by Corbett in contrast to decisive naval battles predicted by Mahan. For also assert that space will serve as arena of joint of military operations rather than independent warfare, which is contrary to Mahan and Corbett emphasis on dominating interstate maritime commerce. Meredith and George Friedman also compare the space and sea power. They argue that space and sea forces operate far from land for long durations, space and naval vessels and few in number and expensive, vast space and sea medium is source of inherent protection, and unseen economic and physical geography shapes operational patterns (Fredriksson, 2006).

Everett Dolman's 'Astropopolitik' is considered as one of the most intellectual work with respect to theory of space power. He defined Astropolitik as study of liaison between outer space and technological developments as well as formulation of military and policy and strategy. Adapting a geopolitical approach to delineate space power, Dolman asserts that some points in space are strategically significant such as LEO-Low Earth Orbit, L4 and L5 Liberation points, geostationary orbit, and Hohmann orbital transfers. He asserts that attributes of space systems and physical characteristics of the outer space model the use of space power. Moreover, his astropolitical analysis aims at formulating persuasive vision for US to further free market capitalism in outer space, repudiate OST-Outer Space Treaty, and exploit space in order to render global security. He considers Astropolitik as a strategy and proposes to exploit military means to dominate space, rather makes provocative suggestions for US to control LEO for the sake of liberal global order. (Catledge and Powell, 2009).

James Oberg analysed the role of space power in earthly activities, and highlighted the challenges and physical workings of space power. He proposed the following axioms which serve as the basis of his space power theory

1. The key characteristic of space systems is their ability to provide broad coverage of earth
2. Space systems can be seen from broad areas of surface of earth
3. Outer space is a unique medium
4. Its impractical to fulfill terrestrial political objectives and direct effect of terrestrial conflict through merely space power
5. Space power is a unique form of national power as the most part of it developed without presence of humans in outer space

6. Successful application of space power requires space situational awareness
7. Greater situational awareness is intertwined with humans' presence in space
8. The prerequisite for becoming space power is the technological competence and concurrently space powers reap technological benefits
9. Space power of a nations depends on the 'Control of Space'
10. Space weaponization is unavoidable
11. Exploration and research in science payoff
12. The nature of space operations is capital intensive
13. Wild Cards are bound to be present (Oberg, 2003)

Oberg underlies the military, commercial, and civil aspects of space activities. His first axiom related to ability of space systems to view entire earth from orbit highlights their strategic significance: to collect and transfer information. Oberg theory substantially takes into account the role of commercial entities regarding space assets and services, notably imagery, communication, and navigation. In contrast to the David Lupton assertion of achieving space control through devastation of adversary's space forces. James Oberg state that being largest space power is essential for space power and space control. This arguments emphasizes the importance of commercial space industry as commercial systems constitute the bulk of overall space systems placed on orbit. However, focus on commercial domain doesn't negate the relevance of military strategy in space, rather the objective of larger space presence is the preservations of state's information flow and interdiction of enemy's information when required.

2.5.2 CATEGORICAL SCHOOL OF SPACE THEORY

David Lupton categorizes the schools of thought having different fundamental beliefs with respect to employment of military forces in the outer space:

Table 2.1 David Lupton's school of thought with respect to space power

Schools names	Key arguments
Sanctuary School	This school considers space as a war-free zone or sanctuary in order to ensure treaty verifications, observation, overflight, and to curb escalation
Survivability School	This school view space systems as fragile which makes them less survivable as compare to terrestrial forces. Proponents of this

	school assert that space forces shall not be relied on for performing key military functions due to their inherent vulnerability
High-Ground School	Superior position in high-ground provides asymmetric advantage over adversary; moreover, space forces' global presence in conjunction with high-velocity or directed energy space weapons enables the state to influence terrestrial operations.
Control School	Space control is indispensable to control land-based events; Control over space line of communications is key to win war on earth; it also increases the ability to deter enemy

Source: (Catledge and Powell, 2009).

After describing these schools of thought, Lupton favours the Control School and suggest that US should have space control to achieve national objectives. Space control has five pillars as per Lupton that are enumerated below

- Logistical structure is necessary (for US) in order to achieve ubiquitous presence in space
- Presence of human beings- beyond machines/ satellites to subdue fog and friction of war
- Space surveillance system placed in space is quintessential
- Space control weapons such as projectile weapons air, land, and sea-based directed energy weapons are substantially instrumental to achieve space control
- Upgraded organizational structure either bureaucratic organization (dealing with the budget division related to combat) or structure that dealing with space forces in operational domain (emission control, employing electronic countermeasures, deploying decoys) (Lupton, 1988).

2.5.3 PROPOSITIONAL SCHOOL OF SPACE THEORY

Michael Smith gave ten propositions to elucidate the nature of space power which signifies the propositional school. These propositions are : Outer space is discrete operational medium; crux of space power is global presence and global access; space power encompasses entire space activity of a state; space professional shall centrally control space power; Space power is a force

that is coercive in nature; commercial space systems can make every actor a space power; assets in outer space compose national 'centre of gravity'; Control in Outer Space is mandatory; Professional working in space must have career-long specialization; and weaponization of space is inescapable. Although the propositions espoused by the Smith are congruous with central themes in works of Dolman and Oberg, they foster space power theory in an independent manner by providing holistic exposition of characteristics of space power and its uses (Smith, 2002).

2.6 SECURITIZATION-THEORY OF SPACE POWER NEXUS

Theory of securitization takes into consideration the elevation of an issue to policy action and security agenda given the discerned existential threat against a particular referent object through a securitizing move. When discussed with respect to outer space, Securitization theory is instrumental in delineating the incessant urge of states to accrue space power through extraordinary means (development of space-related military technology, institutions, and forces) and bringing outer space on their security agenda. Space has become a security issue given the enhanced military use of outer space, emergence of space-related threats and resultantly enhanced threat perception of states from each other owing to arms race and strategic competition in outer space.

2.7 SECURITIZATION OF SPACE

Securitization of space is intrinsically related to the acquisition of space power. Various schools and advocates of space power despite having different approach towards space power deem it significant in order to enhance their power, ensure their strategic advantage over the military operations and in conflictual scenario given the inevitability of use of space for military and strategic purposes. Space power proponents advocates either command of space or space control in order to dominate space for curbing the threats and enhancing their national security. Theory of securitization is extremely relevant in this regard while discussing the outer space. Key space faring nations have chalked their national space security policies in such a manner that depicts the securitization of outer space. This securitization of notably, deeming outer space as quintessential for their security, enhancing space power for averting threats and ensuring their security signifies the use of space power as a mean to protect the referent object (respective states such as US, China, Russia, and Japan and India (discussed in chapter IV) from various space-based and space-related threats.

Table 2.2 Securitization of Outer Space

Referent object	State (to secure the state from various space-based and space-related threats
Securitizing actor	Political leaders and governments of respective states
Securitizing move	a) theory : political leaders emphasis on space related threats and militarization and issuance of various national publications b) Practice : enhancing space military capabilities
Audience	Parliamentarians and policy makers of respective states
Dispositive	a) Regulatory Tools: space policies, space laws, space-related institutions or other institutions related to space policy making or implementation b) Capacity tools: Space forces or space-related forces, military space capabilities

Source: Made by author

2.7.1 UNITED STATES

Space Policy Directives of United State are illustrative of crucial significance of outer space for US security an national interests. These directives signify the fundamentals of space policy of US.

Table 2.3 US Space Policy Directives

Number of Space Policy Directive	**Year**	**Key Theme**	**Explanation**
SPD-1	2017	Revitalizing human space	Modifies the fourth Presidential Policy

		exploration of US	Directive (2010), imploring to carry out space missions beyond Low Earth Orbit
SPD-2	2018	Improving regulations on Space's commercial use	Urges executive branch agencies to reexamine current rules and regulations while furthering foreign policy goals & national security, advancing economic growth, and promoting US leadership in Space Commerce
SPD-3	2018	Policy regarding Space Traffic Management (STM)	Novice mechanism of STM that: fulfills present & future perils ; prioritizing STM innovation and Space Situational Awareness; commensurate with National Security goals; and fosters commercial space growth of US
SPD-4	2019	Formation of US Space Force	Orders Department of Defense to develop legislative proposal formulating US Space Force as sixth branch of Armed Forces of US, alongside constituting US Space Command
SPD-5	2020	Principles of Cyber Security for Space assets	Calls on executive agencies and departments to guard space systems & linked infrastructure from cyber threats
SPD-6	2020	Development of national strategy for SNPP (Space Nuclear Power and Propulsion)	Strategy to guarantee formation and use of SNPP systems for commercial, exploration, scientific, and national security objectives
SPD-7	2021	Space-based PNT(positioning, Navigation, and Timing) policy of US	Develops guidance and implementation actions for Spaced based PNT Programmes of US for various purposes: scientific, commercial, civil, homeland and national security

Source: (Space Foundation, 2023)

The primary focus of US Space policy during the Cold War was countering the threat of Soviet Union in outer space, particularly after the launch of Sputnik. One of the key advanced initiatives against that threat was President Reagan's 'Star Wars', a Strategic Defense Initiative initiated in 1984 with the purpose of providing shield against the ICBM-Inter Continental Ballistic Missiles; however, with the decline of Soviet Union these initiatives also lost their significance. Space security once again came to limelight at the onset of 21st century, but political-cum-economic constraints limited the formation of comprehensive space policy and strategy of US. Nonetheless, US pursued its offensive outlook regarding space that was evident in various policy documents urging it to strengthen space control and exit from ABM-Anti Ballistic Missile Treaty, which US eventually did in 2002.

The 2017 US National Security Strategy depicted a remarkable shift with respect to security aspects of Space. It emphasized US unrestricted access as well as freedom of operation in outer space and considered them essential for US vital interests. National Security Strategy also called for deliberate response in case of attack or harmful interference on US space architecture. This strategy mentioned three priority actions concerning space: 1) further space as key domain- re-establishing US National Space Council to formulate space strategy that conjoins various space sectors for buttressing American Leadership in domain of space; 2) advance space commerce- strengthening competitiveness through commercial space activity and improving space architecture's resilience through government and commercial space sector partnership; 3) Uphold innovation lead in space exploration- promoting public-private partnership beyond LEO with friendly states (White House archives, 2023).

The Space Policy Directive-4 in 2019 led to the formation of US Space Force with the responsibilities to train, organize and equip space guardian/ troops in times of peace to send them to US space Command (the combatant commands) in times of space war or conflict. Space Command was established for carrying out operations related to space domain to defend US interests, deter conflicts, and subdue aggression. 2020 Defense Space Strategy of US also states that Russia and China are carrying out space weaponization to diminish US as well as its allies' freedom of operation in outer space. Additionally, the same document poses the counterspace capabilities of China and Russia as threat to satellites coupled with national

security of US and its key allies. Congress This strategy also states four LEOS-Lines of Efforts that are:

- ➢ Develop all-inclusive military advantage in outer space
- ➢ Merge military space power in operations
- ➢ Frame strategic environment
- ➢ Cooperate with partners, allies, industry, agencies/government departments of US (Department of Defense US, 2020)

The most recent 2022 US policy recognizes outer space as national military power domain underlying multi-domain combined and joint military operations in order to boost national security. It also calls for safeguarding use of space for US economy, national security purposes, and its partners and allies. Additionally, the same policy advocates advanced space capabilities indispensable for deterring conflict and defeating aggression (Department of Defense, 2022). Current US space priorities can be understood while taking into consideration the Department of Defense Budget release for 2022 fiscal year upon the request of President Biden. DoD allocated $20.6billion to build up US space capability to deter conflict and dominate in all-domain warfare. Budget allotment for key programs is as follows

Table 2.4 US budget allotment to enhance space capabilities

Total amount	Projects
$2.6 billion	Next Generation OPIR (Overhead Persistent Infrared) satellite. It will connect with US GEO satellites and interrelated ground systems for missile defense, missile warning, technical intelligence and battlespace awareness
$1.8 billion	2 new Global Positioning Systems follow-on satellite alongside improving current GPS systems
$1.7 billion	5 new launch vehicles: RSLP-Rocket Space Launch Program & NSSL-National Security Space Launch
$20 million	Develop National Space Intelligence Centre
$800 million	Classified space programs

Source : (Mills & Butchard, 2021).

Additionally, DoD has also increased funding for DARC-Deep Space Advanced Radar Capability for identifying and tracking objects in deep space. For better space situational awareness, budget request for Missile Defense Agency of US in 2022 fiscal year entailed programs worth $292 million. One of the high-profile programs includes HBTSS-Hypersonic & Ballistic Tracking Space Sensor to track inbound hypersonic and ballistic missiles (Mills & Butchard, 2021).

2.7.2 CHINA

It is imperative to understand the “Guiding thoughts” of China for space which signify the approach of PLA to outer space. These are as following:

a) **Active defense:** Active defense focuses on the significance of seizing initiative at operational and tactical level. With regards to space operations, it undertakes strategically defensive stance which aims to deter aggression while simultaneously maintaining national interests and security. It that China would not initiate a war in domain of space just like on land; however, it will carry out space combat preparations in order to seize initiatives in operations related to outer space.
b) **All aspects unified:** This concept suggests the necessity of conjoining multifaceted aspects of operations in space. While considering space as holistic domain, all aspects unified takes into account satellites in orbits and land-based mission control; launch; TT & C facilities (Tracking, Telemetry, & Control) enabling the satellite to properly function, coupled with data links that fetters the entire structure. Defense and attack of aforementioned three components is indispensable for China to achieve space dominance. This concept also demands to synergistically contemplate military domains, such as space, air, land, sea, electromagnetic spectrum (electronic and cyber warfare operations), with operations in one domain supporting to, and soliciting assistance from, the other military domains.
c) **Space dominance:** The ultimate goal for PLA is to achieve space dominance which in turn lays stress on targeting the key points of adversary, particularly those key nodes located in ‘combat system-of systems’ of the adversary by using soft-kill and hard-kill weapons to paralyze it. The purpose is dual in this regard: to preclude adversary from

using space assets during a conflictual situation and to efficiently carrying out one's own space-related operations (Cheng, 2020).

The White Papers on Space in 2000, 2006, and 2011 didn't focus on China space power drive. For the first time, China's goal of becoming a 'space power' was explicitly mentioned in the Fourth White Paper on Space activities of China published in 2016, urging China to emphasize space sciences and advanced technology industry, to buttress the actualization of Chinese dream of national renewal. "Space Dream" of China commensurate with the broader "China Dream" proposed by the President Jinping in 2013. Words 'defense' and 'military' always remain missing in all White Paper on Space which either signifies grounds for confidence in purpose and intentions of China, or suggests intentional concealing indicating 'hiding strength & biding time' as espoused by Den Xiaoping in 1990s. Although all space white papers repeatedly mention exploring space for peace/ peaceful purposes; however, the strategic aspect of Space in the Chinese writings is evident in 2015 White Paper on military strategy of China. In that paper, China has equalized space with 'commanding heights' in strategic competition at international level causing China to well-informed about space's dynamics, deal with space-related challenges and threats, and safeguard its space assets for ensuring outer space security, national social and economic development. The key threat for China is US's space-based missile defense systems such as space-based intercept warheads and sensors which can potentially undermine strategic nuclear deterrent of China. (Scott, 2018). The most recent White Paper was published in 2022 which states multidimensional goals of China for outer space. These goals are: to improve its capacity to fathom, unrestricted access, effective management, efficient use of space; self-improvement and self-reliance efforts in technology and science and preserve national security; further high-quality social and economic development; pioneer progress of humans; to support efficient and sound governance of space; and to make beneficial impact in socialist modernization of China as well as to peace and progress for mankind (State Council-People's Republic of China, 2022).

The space program of China kicked off in 1950s when Eighth Party Congress held its second plenary meeting on May 17, 1958, in which Chinese President Mao announced about development of satellite. Howbeit, China became the spacefaring state when it launched its first ever satellite- Dongfanghong on April 24, 1970. In the beginning, the China's space program was civilian as key proponents of its satellite program were present in CAS- Chinese Academy of Sciences; however, the successful test of DF-2 ballistic missile on June 29, 1964 transformed circumstances for alteration in organization and policy, entailing the involvement of People

Liberation Army (Lele, 2019). In 1990s, the military space programs of China gained momentum which is also indicated in the China aerospace engineering reports highlighting China's development of anti-satellite and anti-missile systems.

Operation Desert Storm served as the key event which foregrounded the crucial significance of space in high-technology warfare, notably with respect to C3I- Command, Control, Communications, and Intelligence. By 2002, PLA reckoned "space battlefield" as pivotal element of warfare and began to include it in its programs for military operations. In next fifteen years, PLA enlarged its mission to subsume shielding access to space coupled with managing an enlargement in civilian applications of space through earnest human space program and new satellite technologies. With the Anti-Satellite Test of China in 2007, the space warfare capabilities of China came to limelight (MacDonald, Freeman, and McFarland, 2023).

Currently, China is formulating and stationing anti-satellite capabilities such as constellation of space situational awareness (SSA) sensors for hunting, following, and characterizing satellites in various orbits of Earth. Other ASAT capabilities include ground based missiles to kinetically annihilate satellites; advanced in-orbit satellite attack assets; offensive cyber capabilities to disrupt computer systems; sophisticated laser weapons to degrade, disrupt, and damage satellites alongside their sensors; and electronic warfare capabilities for satellite jamming. China is also upgrading and broadening its space capabilities related to its national security. For example, it owns vigorous cluster of ISR-Intelligence, Reconnaissance, and Surveillance satellites, enabling it to observe military and political developments across the globe. China possess the second largest number of ISR as well as remote sensing satellite satellites, almost 120 in total, the first being the US. Moreover, the number of communication satellites is 34, of which 4 are solely earmarked for military purposes (Rose, 2020).

Another landmark achievement of China in space domain is the BeiDou navigational system (BDS), symbolizing the civil-military fusion strategy of China. BDS is a PNT-Positioning, Navigation, and Timing System, similar to Global Positioning System (GPS) of US. China announced the BeiDou plan shortly after the Third Taiwan Strait crisis in which interruption in GPS led PLA to lose path of its missiles being fired into strait in order to frighten the electorates in Taiwan. BDS consisting of 35 satellites is carefully constructed grounded on development strategy having three steps: BDS-1, first phase was completed in 2000 when BDS provided the services for China itself; BDS-2, second Phase was completed by 2012 when services were

expanded to Asia-Pacific; and BDS-3, third phase reached completion in 2020 when services became worldwide (BeiDou Navigation Satellite System, 2023)

2.7.3 RUSSIA

Russia classifies threats primarily in conventional terms of territorial safeguard from multifaceted military challenges and considers space assets as crucial for military defense and communication. It considers it is circled by adversarial powers and therefore requires 'sphere of influence or buffer in order to protect itself. In present times, Russia has broadened this notion of vulnerability to incorporate attacks from domain of space. Russia employs the term 'aerospace' because of interconnected nature of outer space and air space in contemporary conflicts and threats, and also due to lack of well-defined boundary between both concepts. Presently, the official perceptions of Russia are akin to those during Cold war era. Under President Putin, as in times of Soviet Union, Russia aims at achieving strategic parity with its rival US and thus securitizes 'US threat' with respect to nuclear deterrence. It identifies first strike from US against nuclear forces of Russia from space-based weapons as a major threat (Jackson, 2018).

2014 Russia's military doctrine characterizes the motive to place weapons in space and execution of global strike concept as the fundamental external military risks to Russia. Other military risks include stationing of strategic missile defenses and strategic high-precision non-nuclear weapons. Additionally, this doctrine also lists missile warning systems, outer space monitoring systems, disruption of command and control and strategic nuclear forces as the fundamental threat to Russia (Embassy of Russian Federation to Great Britain & Ireland, 2015).

As per the 2013-2020 Federal Space Program of Russia, there are three goals concerning outer space domain

1. Contributing to growth of economy
2. Increasing national security and buttressing the position of Russia in world
3. Enhancing welfare of Russians

Additionally, the 2016-2025 Federal Space Program also gives substantial importance to massive use and competitiveness of GLONASS system and ground infrastructure pertinent for space-related activities Various Russian policy documents give an insight of its principles of space policy such as spurring socio-economic development through developing space technology ; guarding interests of state, notably right to self-defense; formation of space assets, ground infrastructure, and launch vehicles; development of space complexes; keeping up the

primary position of Russia in piloted flights; and fulfillment of GLONASS system (Jackson, 2018).

In 1957, Soviet Union (now Russia) launched the first ever satellite- Sputnik that kicked off the militarization of space. During Cold War, Soviet Union maintained extensive space presence and tested multiple offensive counter space capabilities chiefly aimed at the key adversary US. Even after the disintegration of USSR, Russia highlighted its motive to remain preeminent space actor, deeming it vital for international prestige and military strategy. Resultantly, Russia created Russian Space agency and Space Force in 1992. In 2000s, Russian economy began to recover and it started to substantially re-invest in strategic space sector and emphasized on modernization of its military space capabilities. In 2015, Aerospace Defense Force of Russia was created merging the missile defense, air defense, and space force under one command (Mills and Butchard, 2021).

Russia is reviving the counterspace capability programs that includes both kinetic and non-kinetic ASAT projects. According to 2022 Annual Threat Assessment by US intelligence community, Russia is fielding various new antisatellite weapons to undermine United States and allied space-related capabilities; moreover, it is formulating, testing, and deploying destructive and non-destructive counterspace weapons such as ground-based antisatellite capabilities, on-orbit capabilities, directed energy weapons, cyberspace and jamming capabilities to target satellites of US and its allies (Gould and Albon, 2022). Russia's focus on counterspace capabilities is evident from launch of two antisatellite missiles in 2020 and another separate non-destructive ASAT test in the same year (Gohd, 2022).

Table 2.5 Russia space capabilities in various domains

Domain	**Names of systems and their functions**
Navigation	GLONASS-Global Navigation Satellite System: Constellation of 24 satellites that provides global positioning services. Russia uses it for military operations and to deploy high-precision weapons
Remote sensing	For radar or optical images of earth, Russia is building various remote sensing satellites such as Obzor R-series & Kondor Series
Early Warning	Spaced Based Missile warning system ● Oka-1: Satellites placed in GEO and HEO to detect launch, notably

	from territory of US (ceased operations in 2014) ● Kupol or EKS: Constellation of 10 satellites in GSO & HEO to detect ballistic missile launch as well as track their landing site
Communication	ESSS- integrated Satellite Communication System ● Meridian Satellites: placed in HEO to communication in hemisphere's northern regions ● Reduga 1-M: placed in GEO, works jointly with Meridian satellites
Signal Intelligence	Liana Constellation ● Signal Intelligence Lotos: passive signal Intelligence (SIGINT) collection space system ● Pion-NKS subsystem: Radar satellite of Russia for maritime reconnaissance
Inspector satellites	Project Nivelir: small satellites such as Cosmos-2499 & Cosmos-2504 to inspect various satellites in orbit

Source : (Bendett et.al, 2021); Hendrickx, B. (20211); (Sky Rocket, 2023).

2.7.4 JAPAN

The Basic Space Law of Japan enacted in 2008 formally changed the Japan's policy towards outer space, primarily in security perspective. This change is attributed to the two key security shocks: a) Launch of ballistic missiles into Sea of Japan by North Korea in 2006 b) Antisatellite test by China in 2007. Prior to passing that law, Japan's space activity was solely non-military in nature. In Japan adopted a unique position with respect to 1967 Outer Space Treaty when its Diet, Parliament of Japan, sanctioned the Peaceful Purposes Resolution in 1969, disbarring any kind of military space activity. While many other states entailing US interpretation of treaty was completely different as they viewed that treaty sanctions non-aggressive military space activity. Peaceful Purposes Resolution also commensurate with pacifist constitution of Japan, notably article 9 of its 1946 constitution which repudiates war , use of threat or force as nation' sovereign right. 2008 Space Law alternated this interpretation in a formal manner by taking two crucial steps in furthering military space activity of Japan that are given below

- It centralized the space policymaking by handing over Japan's Strategic Headquarters for Space Policy the responsibility to make space policy of Japan. Before passing of this law, science and technology bureau controlled the space agencies.
- Basic Space Law authorized the development of non-aggressive military space capabilities, similar to the interpretation of Outer Space Treaty by other spacefaring nations. It highlighted the need of Japan to use outer space for national security (Wilson, 2020).

Article 24 (2) of same 2008 Space Law underlies the formulation of BSP- Basic Plan on Space Policy, Japan's key plan for exploitation of space to propel policies with respect to 'Space development and use'. As of now, four BSP have been issued – first in 2013, second in 2013, third in 2015, and fourth in 2020- grounded on aims for space policy, programmatic targets, measured plans and concrete approaches, and understanding of geopolitical threats. As far as Basic Plan on Space Policy is concerned, it comprises of four key parts

1. Part 1 signifies the environment and context in which Space policy of Japan functions and also highlights the important circumstances such as power balance in outer space, increasing significance of space security, aggravating risks to sustainable use of space, swift progress in science and technology, and ascent of private sector
2. Part 2 reflects the space policy goals which in turn further the national interests of Japan such as space security; bolstering national resilience, disaster countermeasures, and addressing various global issues; actualize economic growth driven by space; and generating knowledge through exploration of space
3. Part 3 underlies the basic stance of Japan for promoting its space policy which entails directions on prioritizations of fundamental facets of space policy, procedures to implement policy, and budget allocation. 2020 Basic Plan prioritizes out-put driven policy of outer space also fulfilling the security requirements of Japan; space policy harnessing human and financial resources; a policy of space enshrining long-term planning to dispense investment predictability; and a policy ensuring the cooperation with states, notably allies.
4. Part 4 entails concreate approaches with regards to space policy, outlining programmatic measures to achieve space policy objectives (European Space Policy Institute, 2020).

Japan is incessantly improving its space defense capabilities. PNT system of Japan called Quasi-Zenith Satellite system launched in 2018 plays an important role in providing the

services. Japan also operates the reconnaissance satellites for radar imagery and optical imagery. The most recent radar satellite was launched in January 2023 by the JAXA- Space agency of Japan (Wall, 2023). Additionally, it also pursues to enhance its Space Situational Awareness through development of deep-space radar system coupled with the command and control centre. To strengthen its communication capabilities and command and control, Japan is also developing X-band communication satellites.

2.8 OUTER SPACE: ENHANCING DEFENSE AND SECURITY DOMAIN

Outer Space has been securitized by various state, notably US, China, Russia, and Japan reflected from their space policies and ever-enhancing development of space military capabilities. This will compel the states to carry out compulsive defensive and offensive strategies and resultantly led to interminable space arms race. Space domain is incessantly transforming into contested and congested domain given the rapid development of military space capabilities and state's enhanced focus on strategic and military significance of outer space.

The use of space technologies for target identification, tracking of adversary and friendly state activities, geolocation, navigation for armed force and civilians and other purposes is rapidly increasing and making it more securitized. The formation, testing, as well as deployment of dual-use satellites coupled with counter space weapons by US, Russia, China, and Japan and other states in order to enhance military effectiveness, prowess, and curb space-related threats to national security is evident from their space security policies. These states have even formed dedicated space forces and have consolidated scenarios related to space in their respective military exercises. All these developments signify that states have constantly been pushing outer space to the forefront of their key defense and security policy agendas in contemporary scenario.

The burgeoning emphasis of states on defense and security aspects of the space implies the enhanced comprehension of space threats, increased understanding of space-based vulnerabilities and threats, intentions of competitors and growing counter-space capabilities. Resultantly, states have securitized outer space to enhance space power, secure their space systems, and increase resilience and connectivity of space infrastructure. The bolstering of space sectors, entailing the national security, highlights that states have conjoined outer space to the realm of national security. The growing space competition and securitization questions

the validity of international law in curbing actions of states with respect to outer space, notably in military domain. Besides the US, China, Russia, and Japan, the securitization of space and state's efforts to increase space power has proliferated to other regions such as South Asia. The next chapter discusses the role of international law with respect to space arms race in general and with respect to India and Pakistan in particular.

IMPACT OF INTERNATIONAL SPACE LAW ON SPACE ARMS RACE BETWEEN INDIA AND PAKISTAN

CHAPTER III

3.1 INTRODUCTION

Space law signifies the body of law indispensable for governance of activities related to outer space. Mainly similar to general international law, space laws consists of international conventions, treaties, agreements, as well as resolutions of United Nations General Assembly alongside the regulations and rules of international organizations. However 'Space Law' as a term is widely connected to standards, principles, and rules of international law enshrined in the preeminent international treaties related to space. Additionally, at the national level, states have enacted their respective legislations in order to govern space-related activities.

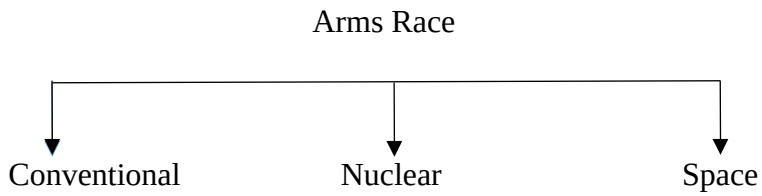
There are various matter which are addressed by the space law, for instance preservation of earth and space environment, disputes' settlement, responsibility for damages attributable to space objects, information sharing regarding possible perils in outer space, protection of astronauts, international cooperation, and use of technologies related to space, thwarting perilous intrusion in space environment and activities, registration and notification of space activities, and most importantly arms control and weaponization of space. Various treaties and agreements provide code for carrying out space activities, entailing freedom of exploration, space as domain of humankind, non-discriminatory use of state as well as principle of non-appropriation.

The focus of all the agreements, treaties and conventions is that space activities shall be carried out in peaceful manner and to accrue maximum benefits that in turn can further the well-being of humankind and countries, notably the emphasis on advocating international cooperation. The space law's odysseys began with the charter of United Nations and Partial Test Ban Treaty and since then various significant developments have occurred in this domain. In present era the efforts are underway as there are proposed international space agreements to curb arms race. The arm race that began in the conventional domain soon transformed into nuclear domain for achieving deterrence under the garb of Mutually Assured Destruction. Soon that nuclear competition between US and USSR gave rise to the space arms race when both superpowers incessantly tried to produce rocket technology for launching the Intercontinental Ballistic Missiles that could carry atomic warhead to a mammoth distance. Resultantly, further developments in space technology led to the launch if artificial satellites as well as space probes

to Mars and Moon. To curb this burgeoning arms race in a new domain, various space treaties and agreements were concluded.

Although there are various agreements that define the conduct of states with respect to outer space and limit space arms race, there are lacunas and loopholes in these agreements, making space an arena of conflict and securitization. In this backdrop, this chapter discusses the various international conventions, treaties, agreements, and code of conduct with respect to outer state. Besides discussing the existing and proposed international space related agreements, this chapter also identifies the major gaps in these agreements, making space a fourth domain of warfare.

Figure 3.1 Domains of arms race



Source: Made by author

3.2 UNITED NATIONS CHARTER

International law's customary rules are applicable with respect to outer space. In 1961, General Assembly of United Nations adopted a significant Resolution 1721 (XVI) which documented two fundamental principles that were later reinforced by Outer Space Treaty article 2 and 3.

1. Charter of United Nations as well as International law is applicable to outer space coupled with the celestial bodies
2. States are free to explore outer space and celestial bodies in accordance with international law. Furthermore, outer space and celestial bodies cannot be appropriated by the nations (United Nations Office for Outer Space, 2023)

3.3 PARTIAL TEST BAN TREATY (1963)

In 1963, the first international agreement aimed at curbing military space activities came about named as Partial Test Ban Treaty. During that time both Soviet Union and United States were carrying out nuclear tests in outer space thus leading to arms control agreement Partial or Limited Ban Treaty given the realization of grave consequences of nuclear weapons on space environment. Soviet Union carried out various high-altitude nuclear tests having warheads with

low-yield (1.2-40 kilotons) in 1961 and 1962. These developments led US to kick off its high-altitude program and it detonated mammoth warhead of 1400 kilotons at 400km altitude over Pacific Ocean named as Starfish Prime. Resultantly, on October 22, 1962, Soviet Union detonated another warhead weighing 300 kilotons at 290km altitude over Kazakhstan coupled with other two such tests but at relatively low altitude. Additionally, Soviet Union carried out tests during the 1962 Cuban Missile Crisis amidst the intensified tensions between United States and Soviet Union. These circumstances led to the Partial Test Ban Treaty in August 1963 and since then, nuclear testing in outer space hasn't been carried out by any state (Harrison, 2020).

While keeping into consideration the framework of Partial Test Ban Treaty, it explicitly forbids the testing as well as use of nuclear warheads on space-to-space and earth-to-space kinetic weapons. More particularly, this treat enshrines the prohibition and prevention of nuclear weapon test explosion conjoined with other nuclear explosion in outer atmosphere and beyond entailing the outer space. However, Partial Test Ban Treaty does not forbid development, deployment, use, and testing of conventional (non-nuclear) space weapons, There are 104 signatories of this treaty; however, few states such as North Korea, China, and France coupled with few other states are not signatory of Partial Test Ban Treaty. (United Nations, 2023).

3.4 OUTER SPACE TREATY (1967)

One of the most significant treaty with respect to outer space is 'Outer Space Treaty' that came into force in 1967. Currently, nearly 110 states are party to that treaty coupled with 89 states that have signed treaty however the ratification is still pending. As far as terms of treaty are concerned, it precludes states from deployment of Weapons of Mass Destruction (WMD) or nuclear weapons in space. However, it doesn't define term WMDs, but generally it signifies nuclear, biological, and chemical weapons. Outer Space Treaty doesn't forbids ballistic missiles' launching that can be equipped with Weapons of Mass Destruction warheads, through outer space. Furthermore, it focuses on peaceful uses of outer space making some defense analysts believe that Outer Space Treaty forbids all weapons in space including WMDs. Article IV is the most important clause of treaty which forbids states-parties to

- Deployment of nuclear weapons as well as any objects carrying Weapons of Mass Destruction in Earth's orbit coupled with celestial bodies

- ➢ Placement of Weapons of Mass Destruction on celestial bodies in conjunction with stationing of such weapons in space through any other method
- ➢ Formation of military installations or bases, carrying out military exercises, or testing weapons (of all categories) on moon as well as celestial bodies (Arms Control Association, 2020).

Furthermore, other provisions of treaty emphasizes that outer space doesn't belong to any single country and every state has right to explore to outer space. As per its provisions

- ➢ Access of space should be to all states and its should be scientifically and freely investigation
- ➢ States can't exert ownership's national claims on space as well as celestial bodies
- ➢ States are to avoid harming and contamination of outer space and celestial bodies
- ➢ States are liable and responsible for damage caused by exploration of outer space
- ➢ Principles of mutual assistance and cooperation shall guide space exploration, urging astronauts to offer aid if required (Arms Control Association, 2020).

This treaty is instrumental as it clearly forbids nuclear equipped space-to-earth and space-to-space kinetic weapons. Furthermore, it forbids testing as well as use of every category space-to-space weapons in military applications on celestial bodies. However, it is imperative to underscore the gaps in this treaty. It doesn't forbid conventionally equipped space-to-space weapons in deep space, earth orbit, as well as orbit around celestial bodies. Additionally, Outer Space Treaty also doesn't preclude conventionally equipped space-to-earth weapons and earth-to-space weapons. In this regard, Partial Test Ban Treaty forbids nuclear-equipped Earth-to-space kinetic weapons.

3.5 RESCUE AGREEMENT (1968)

From 1962-1967, various legal subcommittees negotiated and considered the Rescue Agreement and then in 1967 UN General Assembly passed a resolution 2345XXII signifying a consensus agreement and then a year later the agreement came into force. Rescue agreement explains components of article 5 as well as article 6 of 1967 Outer Space Treaty, calling all the state parties to take plausible actions to assists and rescue the astronauts in distress and briskly return these astronauts to launching state. Furthermore, it calls upon states to offer help to the

launching states when asked to retrieve space objects that lands outside the launching state's territory while returning to earth (UNOOSA, 2023).

3.6 LIABILITY CONVENTION (1972)

This convention 'International liability for damage caused by space objects' is another important agreement with respect to outer space. This international space agreement defines (doesn't limit) actions of states in outer space. Treaty's Article I is significant which underlies various terms considered crucial for comprehending space's weaponization and space weapons. Notably, it underscores the damage not particularly restricted to kinetic effects; additionally, it regards launching states as state that either procures or launches a launch as well as the state from whose facility or territory launch is carried out. Furthermore, Liability Convention differentiates categories of liability from space-to-space and space-to-earth damage.

- Article II: Regardless of any fault, launching state is held liable for space-to-earth damage
- Article II: Launch state is responsible for space-to-space damage given the damage is caused by state's fault or person's faulty for whom that state is responsible.

This convention is signed, ratifies, and accepted by almost 96 states as well as international organization (UNOOSA, 2023).

3.7 ANTI-BALLISTIC MISSILE TREATY (1972)

Another important arms limitation agreement with respect to outer space is Anti-Ballistic Missile (ABM) Treaty which primarily aims at limiting arms race between United States and Soviet Union with respect to defense systems capable to target ballistic missiles. This treaty holds significance in international space law as it curbs arms race of particular category of weaponry on space as well as earth environment. Furthermore, ABT treaty is important with reference to Ad Hoc PAROS Committee, particularly some of treaty's conditions have been expanded in arms limitations agreements, for example, non-interference in NTM-National Technical Means of verification of states; and it has also been included in various new proposal exhibited at Conference of Disarmament such as expansion of measures of ABM Treaty to cover outer-space related multilateral activity (Alves, 1991).

The key objective of this treaty is to curb defense system with the capability to counter strategic ballistic missiles as well as their elements. This entails ABM interceptors, launchers, coupled with radars developed and deployed for carrying out the Anti-Ballistic Missile role as well as tested in mode of ABM. It covers Anti-Ballistic Missile systems that were under construction, operational, undergoing testing/ conversion/ repair, and even mothballed. Article 1 of ABM Treaty enshrines the fundamentals of arms limitations by specifying that state-party shall limit the AMB systems' deployment in accordance with agreed regions and limits. These limitations includes formation, deployment, and testing of ABM systems alongside their components that are mobile land-based, air-based, sea-based, and most significantly, space-based mentioned in its article 5 (United Nations, 2023).

Furthermore, Article 3 mentions the specifics of permissible deployments, by virtue of that state party agrees upon to not deploy Anti-Ballistic Systems as well as their elements, excluding particular number of ABM radars in addition with maximum 100 Anti-Ballistic interceptor missiles deployed at each mentioned launch site, first is deployment site to protect national capital while second is areas entailing Intercontinental Ballistic Missile silo launch sites. Furthermore, other provisions of Treaty obliges state-parties to avoid bypassing objectives of ABM Treaty by developing other types of missiles with ABM capability. Article 6 of Treaty forbids state from

- Giving launchers, missiles, as well as radars besides ABM launchers, ABM radars, and ABM interceptor missiles, capabilities that can target the ballistic missiles alongside their elements coupled with testing in Anti-Ballistic Missile node
- Deployment of future radars that can provide early warning with respect to ballistic missiles asides from particular locations (oriented outwards or along national territory's periphery) (Alves, 1991).

However, ABT treaty doesn't entirely forbid the Ballistic Missile Defense. For example it permits the research, testing and deployment of immobile land-based ABM systems at particular sites. Although it prohibits field testing of any type of space-based BMS systems alongside their components, the laboratory research is allowed. Furthermore, it also allows formation, testing, as well as deployment of laser devices that are space based; and testing of space-based BMD laser's components which are not tested in ABM mode and cannot counter ballistic missiles in their flight.

3.8 REGISTRATION CONVENTION (1976)

"Convention on Registration of Objects Launched in Outer Space" or simple Registration Convention is another important international space agreement which came as a result of 1961 UN General Assembly Resolution and later another resolution of UN General Assembly in 1974 adopted the former resolution. This convention buttresses the Outer Space Treaty and its key objective is guaranteeing national records of states with respect to launch of any object in outer space. Furthermore, it positively endeavors to constitute international registration system as compared to 1961 resolution, 1967 Outer Space Treaty, as well as 1972 Liability Convention. It calls on states to keep up central registry coupled with provision of information to United Nations' Secretary General regarding launching of space objects, as an additional way to classify space objects as well as to apply outer-space related rules. (UNOOSA, 2023).

As far as Article's 2 paragraph 3 is concerned, it provides flexibility in determining information with respect to space objects' registry coupled with premises under which this information is maintained. Contrastingly, article 3 coupled with article 4 of Convention underlies compulsory reporting of launches of space object and maintenance of structure of uniform system by UN Sectary General as mentioned below

1. State party to the convention shall provide to UN's Secretary General the below mentioned information with respect to registration of space objects

- Name of launching states/state
- Registration number/ designator of object launched into space
- Location of launch of territory and date
- Basic parameters of orbit such as inclination, nodal period, function of object, apogee and perigee

2. Provision of additional information with respect to space object to UN's Secretary General by state of registry
3. States are supposed to provide notification to UN'S Secretary General of space objects regarding which it has formerly given information as well as those which are not in orbit of earth. (UNOOSA, 2023).

Conference on Disarmament regards Registration Convention as significant security legal instrument with respect to international space law given the association between holistic

knowledge of space objects, and rational and peaceful use of space environment as the former is indispensable for realizing the latter.

3.9 (ENMOD)-ENVIRONMENTAL MODIFICATION CONVENTION (1976)

In 1970s, the issue of artificial alteration of environment for hostile and military purposes became the international agenda. In 1974, USSR and US acceded to carrying out bilateral negotiations on adopting measures to curb the peril of techniques to bring about environmental modifications for military uses. From 1974-1975, three round of bilateral discussions were held in this regard. In the subsequent year, both states tabled similar draft document of convention at CCD-Conference of Committee on Disarmament. In this conference rigorous negotiations led to the final modified text and resultantly the Convention was sanctioned by UN Assembly's Resolution 31/72 on December 10, 1976. The important aspects of Convention are enumerated as follows

- Article I: State-parties to the convention pledge not to involve themselves in any hostile or military uses of environmental modification methods that can have severe, long-lasting, and widespread repercussions as means of injury, damage, and destruction to other state party.
- Article II: This article defines the environmental modification techniques as any technique that can alter- through intentional manipulation/ exploitation of natural processes- structure, composition and dynamics of earth entailing biota, hydrosphere, lithosphere, atmosphere, as well as outer space.
- Article V: This article enshrines the consultation mechanism for resolving any issue erupting with respect to applications and objectives of Convention, entailing the formation of Consultative Committee of Expert headed by United Nations' Secretary General (United Nations Office for Disarmament Affairs, 2023).

This convention, particularly article I further underlies the significant parameters such as intensity, duration, and area of phenomenon altering the environment for military and hostile purposes. Additional provisions is Article I takes into account a secondary role which calls on states not to induce, encourage or assist, other state/ states coupled with international organization in carrying out such activities. With respect to article II, before the ENMOD Convention, the meetings of the CCD realized that possible alterations to environment through

different techniques, for instance alterations in ionosphere or ozone layer can be done. Given this backdrop, it was anticipated that ENMOD would to some extent shield the satellites against intrusion consequent of environmental disturbance. However, in 1980s UK asserted that outer space had been added in order to expand the area of prohibition and prohibited techniques in the Convention. Presently, that view doesn't have wide acceptance. (Alves, 1991).

Although EMNOD is significant in highlight the artificial means of environmental modification for military applications, it does not prohibit some means of possible environmental alteration. For instance it doesn't forbids the non-hostile techniques coupled with the effects that can travel across the limitations of either one or even more than above mentioned three parameters. Additionally, ENMOD also doesn't forbids the testing, development, research, as well as deployment of any technical devices of military nature that can cause such environmental modification.

3.10 MOON AGREEMENT (1979)

Moon Agreement is significant agreement curbing the militarization of outer space with respect to moon and other celestial bodies. It explicitly forbids uses of force or threats on moon as well as deployment of nukes in orbit around moon. The key provision are as follows

- States shall harness the moon solely for peaceful applications
- Use of force, threat of hostile act, hostile act, or any other threat on moon is forbidden. Similarly, it is forbidden to use moon for carry out such acts or making such threat with respect to moon, earth, spacecraft and its personnel, as well as other man-made space assets.
- It is prohibited to place objects in trajectory, around orbit, or around moon armed with Weapons of Mass Destruction or nuclear weapons, or to directly deploy and use such weapon in or on the moon
- Formation of military fortifications, installations, and bases, military maneuvers, and testing of all weapons on moon is prohibited. Furthermore, use of military personnel for peaceful purposes and scientific research is allowed. Use of facility and equipment indispensable for peaceful research as well as use of moon is also allowed. Interestingly, Moon Agreement has only 18 parties to it, excluding US, China, Russia, and UK (UNOOSA, 2023)

3.11 PAROS TREATY

There are various treaties as mentioned above that prohibit the placement of nukes or WMDS in outer space, however, there are various lacunas in existing international space regimes, causing the arms race in outer space. In this regard, UN resolution 'PAROS-Prevention of Arms Race in Outer Space' which reiterates the basic provisions of Outer Space Treaty and therefore buttresses the prohibition of space's weaponization. This resolution takes in account the existing lacunas in outer space laws and acknowledges that 1967 Outer Space Treaty doesn't fully ensure the curbing arms race in domain of space. Furthermore, it supports various measures to fend off arms race in space, calling the states to comply with the PAROS's objectives. In addition, it urges the CD-Conference on Disarmament which is disarmament negotiation forum of United Nations to formulate ad hoc committee with respect to PAROS (FAS, 2023).

In 1981, CD began considering the viability of PAROS treaty given the heightened given the enhanced discourse over space's weaponization. Resultantly, in 1985 the ad hoc committee on PAROS came into existence by the CD to examine multifaceted issues with respect to PAROS, for instance, nuclear power systems in outer space, legal protection of satellites, as well as confidence building measures. In 1994 owing to opposition from Western, notably the United States who continuously opposed negotiations over treaty. Despite the near-unanimous and annual vote by UNGA-United Nations General Assembly, the committee hasn't been able to convene since then due to vote against resolution by the United States as it considers it unnecessary and denies the arm race in space. In 1990s, US asserted that arms control measures with respect to outer space aren't practical in multilateral environment. Given US's technical leverage in potential weaponry related to space and humungous missile defense program, it has repeatedly went against negotiations over PAROS (NTI, 2023)

.Although in 1980s the initial efforts by the Conference on Disarmament in attaining the consensus on PAROS framework, Russia and China in early 2000s started to work to bring the same issue as agenda of CD. Both states convened open meeting regarding space arms race in 2005 and then two non-binding documented named TCBM- Need for Transparency and Confidence Building Measures coupled with Prevention of Arms Race in Outer Space got approved by the UN General Assembly. These were not new developments, as previously UN had already sanctions similar provisions; however, it is important in the sense that it signified the mutual effort of China and Russia to garner international support for limiting the space

weaponization activities. 36 states sponsored the PAROS document, entailing China, Russia, Iran, India, Saudi Arabia, and Pakistan (Harrison, 2020).

3.12 PPWT TREATY PROPOSAL

Two other significant developments happened in February 2008 in this regard. Russia and China submitted the draft proposal of PPWT-Prevention of Placement of Weapons in Outer Space at UN. After few days, US destroyed its satellite by missile defense interceptor named Standard Missile-3 launched from its ships in Pacific. The interception occurred at low altitude, burning up the debris in atmosphere (Wolf, 2009). Russia and China stated various goals in PPTW treaty such as keeping space free from any type of weapon placement, but it gave a narrow definition of space weapons such as any type of device put in space grounded on physical principle, particularly converted or developed to disrupt, damage, and eliminate functionality of objects in space as well as earth alongside its air. Furthermore, it mentioned the placement of weapon in outer space implies the permanent stationing of weapon in space (for instance moon) or placing it in orbital trajectory. It means that proposal on PPWT includes space-to-earth weapons and space-to-space weapons, kinetic as well as non-kinetic. It doesn't forbid kinetic Earth-to-Space weapons such as Anti-satellite missile tests conducted by China in 2007 and US SM-3 missile test in 2008. It also doesn't forbid other non-kinetic earth to space weapons which Russia and China both possesses (Ministry of Foreign Affairs of People's Republic of China, 2008).

The developments related to PPWT didn't halt as in June 2014 both China and Russia issued the update version of the PPWT treaty proposal. It made changes in the various terms' definition such as it expanded the definition of objects in outer space as any type of device put in space and built for operating therein and also ceased to define space as above altitude of 100km. It also changed the previous definition of space weapons any outer space object while keeping up the same previous phrase that cane disrupt, damage, and eliminate the functionality of object in space, surface of earth and it air. The modified proposal entailed additional explanation on guarding right of self-defense of the states, entailing right of collective self-defense that was previously not mentioned in explicit manner and bear a resemblance to EU code of conduct (Disarmament for a-Reaching Critical Will, 2023). Most significantly, the alternated PPTW treaty proposal is restricted to space-to-earth and space-to-space kinetic and non-kinetic weapons and therefore would not restrict earth-to-space weapons (such as ASAT systems).

3.13 EU CODE OF CONDUCT FOR SPACE

Draft code of conduct for outer space issued by the European Union is another important agreement in International Space law that evaded many key issues plaguing previous efforts of international community regarding prevention of arms race in outer space. This code was devised to entail military and civilian uses of space, notable characteristics of its text entail state's voluntary commitment to avoid deliberate damaging space objects, mechanisms for consultation and cooperation, and measures to mitigate as well as control space debris. It is anticipated that EU will hold negotiations to revise code's text in order to lure more countries.

EU code of conduct entails military, commercial, ad civilian activities that endeavors to amplify predictability, security, and safety of activities in outer space and fend off outer space from transforming into conflict's area. Furthermore, it calls for state to commit to give timely notifications of orbital changes, maneuvers, and malfunctions risking the space objects, including collisions and accidents (European Union External Action, 2023).

There is a criticism against the EU code of conduct and PPWT that both of them permits the potential proliferation of Anti-Satellite Weapons. Advocates of disarmament propose that use and testing of weapons against satellites shall also be banned in conjunction with prohibition of placement of weapons in outer space.

Table 3.1 Space laws and their key provisions

Significant Space laws	Date	Key provisions
United Nations Charter	1945	● Applicability of international law to space ● Free exploration and non-appropriation of space
Partial Test Ban Treaty	1963	● Forbids testing & use of nuclear warheads on space-to-space and earth-to-space kinetic weapons
Outer Space Treaty	1967	● Forbids placing WMDs or nukes in orbits as well as celestial bodies ● Peaceful use and exploration of space
Rescue Agreement	1968	● To help and save astronauts in distress

Liability Convention	1972	● Launching state is responsible for earth-to-space and space-to-earth damage
Anti-Ballistic Missile Treaty	1972	● Limits various types of ABM systems
Registration Convention	1976	● Registration of launched objects in space by launching state
Environmental Modification Agreement	1976	● Precludes artificial means of environmental modification for military uses
Moon Agreement	1979	● Peaceful use of moon ● Prohibits threat/use of force, threat of/or hostile action on moon ● Forbids militarization of moon and placement of WMDS in trajectory or orbit around moon
PAROS Treaty	1981 (adopted as resolution)	● Prevent states form placement of objects equipped with any kind of weapon in orbits
PPWT Treaty Proposal	2008	● Forbids space-to-earth weapons and space-to-space weapons, kinetic as well as non-kinetic
EU Code of Conduct for Outer Space	2008	● Peaceful use of space; preservation of integrity and security of space objects; emphasis on defense interest of member states

Source: Made by author ; Data retrieved from (UNOOSA, 2023), (Shairwal, 2021); (NTI, 2023); & (United Nations Office for Disarmament Affairs, 2023).

3.14 INTERNATIONAL SPACE LAW AND INDIA-PAKISTAN SPACE ARMS RACE

It is essential to analyze India's adherence and stance on international space law in order to deduce the reasons for ever-enhancing India's militarization of outer space and growing disparity of space capabilities between India and Pakistan.

India joined the ad hoc committee formulated by United Nations, named as COPUOS-Committee on Peaceful uses of Outer Space as well as other subcommittees (dedicated for technical and scientific purposes), responsible for formulation of international Space law. COPUOS has a significant role in negotiating five international space agreements/treaties and India is signatory member of these agreements enumerated as follows: a) 1967 Outer Space Treaty; b) 1968 Rescue Agreement; c) 1972 Liability Convention; d) 1975 Registration Convention; and e) 1979 Moon Treaty (Shairwal, 2021). India's selective membership of International space treaties itself signifies India's reluctance to curb arms race and that its quest for space power doesn't commensurate with the space treaties limiting or curbing the development of testing of space weapons or technologies. Furthermore, India's is signatory to either those treaties (such as Outer Space Treaty and moon agreement) that forbids the space-related or space-based nuclear weapons on orbits or moon; the agreements that are primarily related to civilian applications of outer space (rescue agreement, registration convention; or the agreements that doesn't prohibit the development of offensive space technologies such as anti-ballistic missiles system development, anti-satellite capabilities, laser capabilities, and earth-to-space kinetic weapons. India's lack of membership to such treaties that forbid the aforementioned development is itself illustrative of ensuing India's participation in space arms race.

However, India's diplomatic stance has always been the same that it supports the peaceful use of outer space (Rohera, 2022). That stance contradicts the India's development of anti-ballistic missile technologies, its testing of anti-satellite weapons, and its use of space for burgeoning Intelligence, Surveillance, and Reconnaissance purposes (as discussed in Chapter no.4).Moreover, India's stance on space weaponization and development of indigenous anti-satellite capabilities contradict each other. In 2017, when India tested its ASAT weapon capability, it reiterated that it still is against space weaponization and this tests provides India with credible deterrence.

As far as Pakistan's position is concerned, given the substantial disparity with respect to space capabilities with India and its nascent space program in comparison to India, Pakistan hasn't developed offensive space capabilities such as anti-ballistic missiles systems or anti-satellite weapons. Furthermore, Pakistan has few satellites that it launched with the help of China as it hasn't launching capability (discussed in chapter no.5).

Pakistan also opposes the militarization and weaponization of outer space. As per the Pakistan's ministry of foreign affairs, the testing of ASAT weapons and ABM systems coupled with their merger with space systems has endangered the outer space's peaceful uses that shall be adequately addressed through PAROS. On regular basis, it has been co-sponsoring PAROS resolution; in addition, since 2013 country has also been co-sponsoring 'No First Placement of Weapons in Outer Space' Resolution. Furthermore, Pakistan buttresses the acceptance of PAROS to address the lacunas is international space law and to forbid all types of weapon's placement in space as well as prohibition of use o threat to use force against state's outer space objects. (MOFA-Pakistan, 2023). Pakistan is party to and ratified Outer Space Treaty, Rescue Agreement, Liability Convention, and Registration Convention. It has signed the Moon agreement but hasn't ratified it. It is worth noting that Pakistan has signed and ratified the same agreements as India and it hasn't ratified or signed those agreements which prohibit the development of earth-to-space weapons and anti-ballistic missile capabilities. Although the county has no intention and no capability in this regard, it still doesn't signed such treaties that in future might go against these developments.

Space laws though enacted to serve as a staunch barrier against the space arms race, they aren't fulfilling the purpose of their development. There are three key reasons in this regard. To begin with, the trust deficit between the states; for example, in case of India and Pakistan both sides are weary that other might resort to development of offensive technologies and hence remain non-signatory to the key space agreements that limit arms race). Secondly, the threat perception between states which limits states ability to either rectify or implement these agreements and move towards disarmament; for instance, the threat perception of India and Pakistan against each other since the time of independence has been escalating causing them to resort to development of advance military weaponry to ensure their security. Lastly, the lack of consensus between the states regarding the clauses of space laws and different interpretation also substantially limits the effects of space laws.

INDIA'S PURSUIT OF SPACE POWER

CHAPTER 4

4.1 INTRODUCTION

Since early 1960s, India has been carrying out colossal space program and has gradually acquired substantial capabilities in space related civil, commercial, military technologies. Most importantly, India furthered its military space program after the Kargil war with Pakistan in which military of India had poor real-time information coupled with lack of satellite imagery. Since then, India has been incessantly developing and upgrading its indigenous space capabilities and has considerably developed TES-Technology Experiment satellites of high resolution. India is one of the key space-faring nation that can launch its own satellites, have mega fleet of various types of satellites, launch vehicles, and recently it has tested its anti-satellite capability as well.

In 1960s when India began to develop its space program, it had limited national resources and at that time the focus of its space program was meeting the economic and social development needs. However, in the last ten years, India has furthered its space program that is characterized by two significant changes: a) zealous space program; b) enhanced space's use for military and national security purposes. In present times, the national security concerns of India are focused on China and its ever-enhancing counter-space capabilities, causing India to divert its attention to military aspects of space program and to enhance its space industry. Most importantly, India also aspires to become preeminent state with colossal space program making it a more prestigious state in the world. India is making substantial leaps in commercial, civil, and military space capabilities in order to accrue space power which it considers indispensable for meeting its national security needs and to avoid the various national security threats. The

securitization of outer space discussed in chapter one also underlies India's pursuit of space as it has elevated its space sector development at the national security level and has securitized evident from space policy, ever-enhancing space capabilities, and expansion of space program.

In this backdrop, this chapter discusses India's pursuit of space power by discussing and analyzing a) History of Indian space program; b) Space Vision of India, c) Fundamental drivers of its space program; d) Space doctrine as well as Space Policy of India; e) civilian and commercial space capabilities of India; f) Military space capabilities of India and its nexus with ballistic missile and ballistic missile defense; g) Anti-Satellite capability of India.

4.2 HISTORY OF INDIAN SPACE PROGRAM

Genesis of India's Space program can be divided into two distinct phases of development: 1) Initial stage of two decades focused on procuring basic space infrastructure and carrying out experiments with less-developed systems; 2) Stage two of one decade aimed at developing as well as flight-testing more efficient and capable systems.

4.2.1 STAGE 1: 1960s-1980s

Starting since 1960s, first stage included constructing administrative framework alongside gaining familiarity with elementary rocket operations. From 1963-1975, Indian scientists gained experience and knowledge of rocket launching due to multiple rocket launching of states-such as US, Britain, USSR, and France- from South India (Milhollin, 1989). Additionally, the institutional space mechanism kick started in 1969 with development of ISRO- Indian Space Research Organization under the auspices of India's DAE-Department of Atomic Energy. For the purpose of policy formulation, and supervising execution of space-related projects, India also established space commission in 1972. Taking into account significance of space activities and to conduct executive monitoring, India decided to institute DOS-Department of Space in 1972 and placed ISRO under it (Sachdeva, 2016). DOS executes the various programs enacted by Space Commission through ISRO and various other laboratories such as PRL-Physical Research Laboratory, SCL-Semi-Conductor Laboratory, NE-SAC- North-Eastern Space Applications Centre, and NARL-National Atmospheric Research Laboratory (ISRO, 2023). In this stage, the role of Vikram Saarbhai-first chariman of ISRO is significant as he persuaded political leaders of India to enhance funding for India's space missions and developments in late 1960s. First stage's latter phase emphasized on primarily on experimental and low-profile space related projects permitting scientists in India to acquire experience in development and operation of space launch vehicles and satellites.

This phase (1979-1983) is characterized by development of Communication Satellites such as APPLE, Earth Observation Satellites (Bhaskara), and successful flight tests of Space launch Vehicle named as SLV-3 (Misty, 1998).

4.2.2 STAGE 2: MID1980s-1990s

Indian space program in its second stage was grounded on efficient and mission-specific systems. Beginning in mid-1980s, stage two included developing the PSLV-Polar Satellite Launch Vehicle and its GSLV-Geosynchronous Satellite Launch Vehicle, which were mainly built to launch the IRS-Indian Remote Sensing satellite as well as meteorology and communications satellite systems named as INSAT-Indian National Satellite. In 1997, India launched the PSLV followed by GSLV making India space faring nation with advanced space agencies (Misty, 1998).

4.3 INDIA'S SPACE VISION

The future goals of Indian space program can be inferred through Indian Space Research Organization vision 2025. It includes

- To formulate of satellite-based navigation and communication systems to increase rural connectivity
- To increase image capability for efficient management of weather, natural resource, and aid in climate change studies
- To increase space science mission for better understanding of universe and solar system
- To build reusable space launch vehicles
- To build up India's heavy-lift space launcher capability
- To develop human spaceflight capability (Goswami & Garretson, 2020).

4.4 FACTORS DERIVING INDIAN SPACE PROGRAM

4.4.1 GEOPOLITICAL ENVIRONMENT

According to various analysts, the national security concerns of India play an enormous role in furthering the space capabilities of India, particularly in military domain. According to Indian research analysts such as Rajeswari Pillai Rajagopalan, geopolitics has been the key factor in

India’s quest for military space program. He asserted that it was an imperative for India to step up in this domain given the China’s growing space capabilities (Pasricha, 2021).

The continuous advances of China with respect to space warfare is a major concern for India. It is evident from various official statements of India such as by A.K. Antony, Indian Defense Minister. In June 2008, he gave an address to the United Commanders Conference held in India in which he regarded developments in its neighbor a potent threat to space assets of country. He indirectly emphasized Chinese space threat when he specifically mentioned the rise of heavy lift off boosters, anti-satellite weaponry, and other military space devices in region (Rao, 2009).

In 2007, when China tested its anti-satellite capability, it became a caveat for India to aptly address the emerging space security threats. Twelve years later, India tested its own ASAT weapon to demonstrate the counter space capabilities as a deterrence mechanism. India’s adversarial relationship with its two nuclear neighbors-China and Pakistan- is deriving India to develop potent counter space capabilities (Pasricha, 2021). Additionally, the geopolitical game in Indo-Pacific region, particularly the China’s maritime silk road, has also influenced the space reforms of India (Giri, 2021).

India’s threat perception from Pakistan has also played significant role in shifting the space priorities of former. 1999 Kargil conflict with Pakistan revealed the loopholes in military space capabilities of India when its space assets failed to carry out continuous surveillance and remained unable to provide the intelligence, weather inputs, and targeting information vis-à-vis Pakistan (Moltz, 2011). Additionally, India also considers log-range ballistic missiles of Pakistan as a threat against which India has enhanced space-based ISR capabilities and developed Anti-satellite weapon to curb the threat.

4.4.2 COMMERCIAL FACTORS

The space program of India is also driven by its aspirations to enhance its footprints in commercial space market. In 1992, India established the Antrix Corporation Limited, commercial/marketing arm of Indian space agency ISRO. This government owned private limited company has various aims: commercial exploitation and advancement of space products; transfer of indigenously developed technologies; technical consultancy services; and to further development of industrial space capabilities (ISRO, 2023). Presently, BJP government under Prime Minister Modi has also undertaken various steps to buttress country’s entrepreneurial role in space sector. The most noteworthy development in this regard is development of ISpA-Indian Space Association in 2021 in order to further space technology.

(find). In the last few years, Newspace- surge of private space industry in India has witnessed a boom, engendering various reforms and regulatory frameworks in country. Deriving commercial profits from Space industry of India worth $400 billion has become a key motive of the present Indian government. While delivering a speech, Prime Minister Modi asserted that his government's approach to reforms in space sector (privatization) was grounded on enabling role of government, giving freedom to private sector for technological innovation, and regarding space as an avenue for progress. Additionally, he highlighted the indispensable role of space sector with better imaging, mapping, and connectivity facilities for people; improved forecasts of natural disasters; and enhanced income and security of fishermen (Embassy of India, Moscow –Russia, 2023).

4.4.3 DOMESTIC FACTORS

Various domestic factors also play an indispensable part in India's quest to expand and strengthen its space program. These factors can be divided into three parts

a) **Role of space program in nation-building:** From Indian prime minister Nehru to scientists like Homi Bhabha and Sarabhai, space was considered as key to nation-building and this perspective played important part in formation of ISRO.The current BJP administration also hold the similar perspective of space power projection of India and nation-building.

b) **Legitimacy of government:** Achievements in space leads to regime legitimacy and popularity. Various Indian Prime Ministers such as Nehru, Indira Gandhi as well as Modi take pride in their scientific disposition towards space and regards it essential for national development

c) **Space-driven national development and prestige**: Use of space assets in providing various national requirements such as weather forecasting, early warning for disasters, fishery, agriculture, tele-education, tele-medicine has also urged India to develop and upgrade its space program. In terms of external status and prestige, the indigenous space capability is a source of prestige and power for India, for example in became first Asian nation to reach mars in 2014 (Goswami, 2022).

4.5 INDIA'S SPACE DOCTRINE

India doesn't have any official space doctrine however the key aspects of undeclared space doctrine can be traced from the Airforce doctrine of India. Back in 2012, India's airforce

doctrine had ambivalent perspective of space power, regarding that space power couldn't act as solution for informational gaps or replace the key military capabilities. Additionally, 2012 doctrine explicit expressed the need to rationalize country's space power needs rather than maximum exploitation of resources to enhance space power. This was termed as criteria of 'availability and affordability', signifying ad-hoc approach towards acquiring space power. However, in present times, India enormous focus on space power is evident from its colossal investment in military, civil, and commercial space capabilities. As far as doctrinal shift is concerned, it is evident from the India's 2022 doctrine of airforce which clearly plumps for aerospace power instead of air power. Moreover, the same doctrine emphasizes increased exploitation of outer space to realize the national objectives. It also highlights the civilian space program of country and simultaneously advocates the civil-military integration for space control in order to decrease dependence of India on external actors. In addition, it suggests that enhanced capabilities with respect to aerospace domain can help it forge constructive engagements with other states (Khalid, 2023). India shift towards aerospace power as per the IAF recent doctrine is based on space and air continuum, unavoidable and huge space reliance of service, and necessity to protect space-related and space-based assets (Choudhury, 2023)

4.6 INDIA'S SPACE POLICY

4.6.1 INDIA'S SPACE POLICY IN COLD WAR ERA

The space program of India is governed by various international agreements and national laws; however, there is no official or declared India's national space policy outlining the civil, military or commercial goals in space. The diplomatic position of India has been the same that is harnessing the space technology for providing numerous benefits to planet Earth and peaceful use of outer space. In contrast to other spacefaring nations such as US, Russia, and China, space program of India had civil background, with ISRO-Indian Space Research Organization being the fulcrum of space activities of India (Rohera, 2022).

The traditional stance of India has always been the opposition to outer space's militarization which is repeatedly reflected in its blatant denunciation of anti-satellite and missile defense programs of major powers. Krishna Rao, Indian representative at the United Nations meeting on Outer Space gave a statement emphasizing on the outer space regime of cooperation and opposing the confliction. Additionally, in 1968, Indian Prime Minister Indira Gandhi sent a message to the Secretary General of UN in which she laid substantial stress on peaceful applications of space such as meteorology and telecommunication. In the same message, she

also highlighted India's willingness to further the international collaborations in space domain (Rajagopalan and John, 2014).

Indian space policy with enormous focus on space's non-militarization endlessly opposed the offensive use of space systems. This was evident at multiple times, especially when India opposed the 1980s US's Star Wars or SDI-Strategic Defense Initiative as well as space race between USSR and US during Cold War, entailing their Anti-satellite satellite tests. The rationale behind the opposition was that these space-related developments were amplifying the arm race especially with regards to nuclear arena. In 1983, Prime Minister Indira discussed the issue of space at United Nations General Assembly; furthermore, Narishma Rao, the foreign Minister during government of Indira Gandhi made harsh statement regarding arms race in outer space. She stated that arms competition in space would permanently undermine the peace and disarmament that in turn could lead to escalation blowing up the entire earth into small pieces (Tellis, 2006). The stance of India signified its speculations that space assets would be employed in ASAT and missile defense programs. Despite that firm position, it didn't averse the use of space assets for other military uses such as military communication and surveillance.

During these years the proactive policy of country propagated the ban on weaponization of global commons such as outer space and sea beds; additionally, it called for weapons-free space domain through development of global architectures. The successor of Indira Gandhi, Rajiv Gandhi advanced the space policy of his predecessor and issued a 'New Delhi' declaration with Greece, Sweden, Tanzania, Argentina, and Mexico in 1985. The declaration called for prevention of arms race in outer space and cessation of nuclear testing (Los Angeles Times, 1985).

Sovereignty and morality angles were the key drivers in the India's opposition to militarization of space in 1970s and 1980s. It supported the buttressing of sovereignty of state and implored to restrict the employment of direct broadcast satellites. This time period is characterized by the concepts like universal, comprehensive, and non-discriminatory disarmament which were fully propagated by arms control analysts of India ((Rajagopalan and John, 2014).

4.6.2 INDIA'S SPACE POLICY IN POST-COLD WAR ERA

In post-Cold War era, the position of India regarding arms control issues and outer space remained same evident from various official statements. For example Salim Iqbal Sherwani, India's minister of state for external affairs answered the question related to space technologies

of US and reiterated India's staunch position on curbing arms race in domain of space and its opposition to ASAT weapons (Rajagopalan and John, 2014).

Various signs of shift in India's space policy are visible since 2001, given the changing strategic milieu. One of the most important factor bringing the change in policy was acquisition of long-range missiles by Pakistan which prompted India to develop its ballistic missile defenses. Due to its own domestic security needs, Indian response was sympathetic towards US when Bush Administration decided to exit from ABM-Anti Ballistic Missile Treaty in 2001. Within one decade, military (missile) capabilities of India accelerated indicating its discriminatory viewpoint towards security of outer space. Further reevaluation in India's space policy occurred when China tested antisatellite weapon in 2007. Pranab Mukerjee, then Minister of External Affair in a speech in Indian Parliament asserted that burgeoning civilian space investments of India are threatened from technological space tests of China (Rajagopalan, 2019). Minister Mukerjee also laid a substantial emphasis on peaceful uses of space and urged international community to buttress internal legal regime with respect using space for peaceful purposes (Ministry of External Affairs, Government of India, 2007).

However, while addressing the people in an international seminar on aerospace power, Minister Mukerjee stated that space-based assets are indispensable to brace military force multipliers and these assets act as salient national infrastructure which should be denied or guarded from enemies. (Press Information Bureau, 2007). ASAT test of China alarmed the Indian policymakers, defense intellectuals and scientists. On one hand, Pranab Mukerjee underlined the peaceful purposes of outer space; while on the other hand, scientific and defense bureaucracies carefully amassed support for developing own antisatellite weapon of India (Satyanath, 2023).While realizing the significance of space security amidst the ongoing space race, India developed Integrated Space Cell in 2010 for improving the military utility of space based assets. Additionally, India called for greater coordination between ISRO and DRDO to deal with growing space-based threats following the 2007 China's test.

The research on antisatellite capability sanctioned during the government of Manmohan Singh came out as full-fledged ASAT during Narendra Modi's government (Rajagopalan, 2022). In 2019, India carried out its own direct-ascent ASAT test also known as mission Shakti, signifying the enhanced importance of outer space for military applications for India. Prime Minister Modi called the ASAT test by India a 'historic feat' and asserted that India has become established space power. He said that ASAT was defensive in nature and India's position with

respect to outer space was unchanged that outer space shouldn't be considered area for warfare. Despite the public statements, India is incessantly trying to deter and match military capabilities of its arch enemy China and therefore its ASAT weapon development may have been carried out to warn the China which successfully launched its ASAT test in 2007 (Davenport, 2019). Ministry of External Affairs explained the rationale of ASAT test that it would provide India credible deterrence against long-range missiles threat to its ever-enhancing space-based assets (Ministry of External Affairs, India, 2019*)*. Additionally, in 2022, United States sponsored a moratorium on antisatellite missile test at the UN Security Council in order to curb testing of debris-creating and lethal anti-satellite missiles. India abstained its vote from proposed test moratorium arguing that US-backed resolution doesn't take into account legally binding aspects of moratorium (United Nations press, 2022).

It is expected that India will formally declare its space policy in 2023. Country has already released the space policy draft, supporting the development of innovative and vibrant space ecosystem. This space policy will underlie the working of non-government actors in sector of space while simultaneously aiding private sector in India through IN-SPACe- Indian National Space Promotion and Authorization Centre (Mishra, 2023). Operating under auspices of Department of Space, IN-SPACe is nodal agency formed in 2020 to further space technology and in turn space economy of India (IN-SPACe, 2023). This policy shift indicates the role of privatization in space sector as space industry of India is open to various private players like Pixxel and Skyroot.

4.7 INDIA'S CIVILIAN SPACE CAPABILITIES

4.7.1 MANGALYAAN: MARS ORBITER MISSION

One of the most significant civilian space mission of India is 'Mangalyaan' which is a MOM-Mars Orbiter Mission. ISRO developed the space probe and launched it through PSLV-Polar Satellite Launch Vehicle on November 5, 2013. It is first interplanetary mission of India, making India fourth state in world and first in Asian region after Soviet's Roscosmos, US' NASA, and Europe's European Space Agency to successfully carry out the Mars mission. G Madhavan Nair, former ISRO chairman acknowledged the Mars mission of India in 2008 and then Indian Prime Minister Manmohan Singh authorized the program in 2012. Key objective of MOM is to study minerology, surface features, atmosphere, and morphology of Mars. Additionally, it will help India in developing technologies for other interplanetary missions.

Till now, Mangalyaan is the least-expensive mission to Mars with cost of $75 million. (Business Standard, 2023).

4.7.2 CHANDRAYAAN: INDIA LUNAR MISSION

The lunar mission of India also named as ‘Chandrayaan’ are another remarkable achievements of India in space domain. On October 22, 2008, ISRO launched first lunar probe of India named as ‘Chandrayaan-1’ for photo-geologic, mineralogical, and chemical, mapping of Moon. 11 scientific instruments made in USA, India, Germany, UK, Bulgaria, and Sweden were used in that spacecraft. After carrying out the desired tasks, ‘Chandragyaan’ was completed on August 29, 2009, when communication with satellite got terminated (ISRO, 2023). In September 2019, India launched another lunar space craft named as ‘Chandrayaan-2 Vikram Lander’ which failed when the lander failed to land on the site and lost communication (Business Standard, 2023). However, India is planning to launch another moon mission ‘Chandrayaan-3’ in June 2023 with better moon rover onboard (NDTV, 2022).

4.7.3 SATELLITES FOR CIVILIAN PURPOSES

INSAT-Indian National Satellite System is regarded as one of most largest and advanced communication satellite systems in region of Asia-Pacific. Currently the number of operational geo-stationary satellites of the system is nine. In 1983, ISRO launched the first satellite of the INSAT system called INSAT-1B, kicking off the revolution in communications sector of India. The various services provided by INSAT system are telecommunication, satellite newsgathering, television broadcasting, weather forecasting, societal applications, and lastly search and rescue operations (ISRO, 2023). Other telecommunication satellites joining the India’s INSAT constellation are the GSAT-series, that are dual purpose satellites used for video, audio, and data broadcasting. ISRO launched the first GSAT satellite, GSAT-2 in 2003 and the latest satellite of the same series GSAT-30 in 2020 (ISRO, 2023). Additionally, India has various remote sensing satellites for earth observation. These satellites have temporal, spectral, ad spatial resolution in order to fulfill multifaceted requirements for India and other states. The key civilian applications of these satellites are covering water resources, agriculture, rural development, urban planning, environment, mineral prospecting, disaster management, ocean resources, and forestry. Operational satellites given below

4.1 Operational civilian satellites of India

Total number	Orbit	Names

13	Sun-synchronous	● RESOURCESAT-1 ● RESOURCESAT-2 ● RESOURCE-2A ● CARTOSAT-1 ● CARTOSAT-2 ● CARTOSAT-2A ● CARTOSAT-2B ● RISAT-1 ● RISAT-2 ● OCEANSAT-2 ● SARAL ● Megha-Tropiques ● SCATSAT-1
4	Geostationary orbit	● INSAT-3D ● INSAT 3A ● INSAT- 3DR

Source: (ISRO, 2023)

4.8 COMMERCIAL SPACE CAPABILITIES OF INDIA

The role of private sector in India's space sector is a recent phenomena. Currently, the private space sector of India is taking strident leaps given the worldwide trend of ever-enhancing role of private space industries such as SpaceX, Blue Origin, and ispace in formulating key technologies. In India various private companies are working on space sector. Few names are given below

- R-beam is working on wireless transmission
- Bellatrix key working domain is rocket propulsion

- Dhruva Space is working on small satellites
- Satsure uses satellite data useful for agriculture, climate-resilient infrastructure, and disaster management
- Blue Sky Analytics key area of work is space-based ISR for pollution monitoring
- Exseed Space is another remarkable private space startup in India which remained successful in developing as well as launching using medium lift launch vehicle (Falcon 9) taken from SpaceX
- TeamIndus is building lunar landers and spacecraft (Goswami, 2020).

Given these developments, India's department of Space gave funding to the NSIL-NewSpace India Limited. NSIL is a public sector entreprise and ISRO's commercial arms established in 2019 with aim of privatization and commercialization of space capacities of India (NewSpace India Limited, 2023). Additionally, the creation of Indian Space Promotion and Authorization Centre is a step is boosting the activities of private companies in space sector.

4.2 Evolution of India's space capabilities

Phase I (1960-1970) **Initiation of space program**	**Phase II (1980s))** **Experiments related to space technology**	**Phase III (1990s)** **Operationalization of space systems**	**Phase IV (2000-present)** **Expansion of space technologies**
● Formation of ISRO and Department of defense ● Capacity building ● Scientific quest	● Experimental missions ● Development of launch vehicles ● Launch of satellites INSAT ● Low profile space missions such as Rohini satellite launch ● Provision of satellite based services	● Operational missions such launch of PSLV and GSLV ● More institutional frameworks such as Antrix- ● Launch of INSAT and IRS satellites	● Consolidation of space program and innovative missions ● Mars orbiter missions ● Indian lunar mission ● Launch of GSAT series ● Indian navigation system ● New institutional developments related to military use of space

			● Dedicated military satellites ● Increase in dual-use satellites for ISRC4 purposes ● Ballistic missile defense testing and completion ● ASAT weapon test ● Commercialization of space sector

Source: Made by author; Data retrieved from (Rajagopalan, 2019); (ISRO, 2023); (Rajagopalan, 2020).

4.9 MILITARY SPACE CAPABILITIES OF INDIA

4.9.1 INDIA'S NAVIGATION SYSTEM

IRNSSS consists of seven satellites; withal, there are other two other standby satellites on ground. In 2006, Indian government conceived the regional navigation system and allocated colossal amount of 1429 crore INR for development of ground and space infrastructure. The key driver behind the establishment of independent system is to eliminate the Indian military's dependence on Global Navigation Satellites system controlled by foreign governments in conflict situation. For example, during Kargil war India was totally dependent on PNT services on US GPS during Kargil War (Khatri and Chauhan, 2016).

India has indigenously developed independent IRNSS- Indian regional navigation satellites system in order to furnish precise position information services to Indian users and also in region stretching up to almost 1500 km which is also regarded as the primary service area of India. The services provided by this system are of two types

1. SPS-Standard Positioning Service to all its users (for civilians)
2. RS-Restricted Service, a secure and encrypted service for authorized users (for armed forces)

Various services of IRNSS are stated below

- ➢ Aerial, Terrestrial and Marine Navigation

- Precise Timing
- Geodetic data capture and mapping
- Tracking of vehicles and management of fleet
- Disaster Management
- Voice and visual navigation for drivers
- Integration with cell phones (ISRO,2023)

4.9.2 INSTITUTIONAL DEVELOPMENTS

Institutional changes are also extremely significance in harnessing the outer space for military operations which Indian military has been doing consistently. India developed Integrated Space Cell in June 2010 and placed it under the Defense Ministry's Integrated Defense Services Headquarters. Being mutually operated by the civilian space institutions such as ISRO and Department of Space and all three services (airforce, army, and navy) of Indian military, Space cell seeks to engender integration among all the aforementioned agencies and develop an efficacious process to exploit outer space for military uses. Additionally, space cell assesses and reviews the various threats to the space assets of India. Besides Space Cell, in 2012 another key institutional development is formation of ACNS(CSNCO)- Assistant Chief of Naval Staff (Communications, Space and Network Centric Operations) office charged with managing and supervising military capabilities related to outer space. This institutional innovation is in consonance with the goal of Indian Navy to bring a shift from plat-form centric naval force to network enabled Indian Navy (Rajagopalan, 2020).

In September 2018, India also established the DSA- Defense Space Agency which is tri-service agency responsible for the formation of space strategy of India. DSA became operation in 2019 and is located in the Bengaluru. DSA includes nearly 200 personnel from Defense Satellite Control Centre as well as DIPAC- Defense Image Processing & Analysis Centre (Prasad, 2020). Additionally, in the same year Prime Minister Narendra Modi sanctioned the development of another space agency called DSRO- Defense Space Research Organization responsible for making space warfare technologies and weapons systems. DSRO is also entrusted to help the DSA in the field of research and development (India Today, 2019).

4.9.3 SATELLITES FOR MILITARY PURPOSES

Changing security environment has been a playing a potent factor affecting the space program of India. Since 2010s, India is continuously investing in military space capabilities given the space arm race at global level in general and regional level in particular (neighborhood of India). In August 2013, India launched its first ever multi-band communication satellite-GSAT, also named as Rukmini, solely dedicated to dispense services to the defenses forces of India, primarily Indian Navy. With the 480 crore INR foreign launch cost and 185 crore INR satellite cost, this satellite will provide real-time and secure communications among India aircrafts, warships, land systems, and submarines. Additionally, GSAT-7 also termed as INSAT-4F will remarkably upgrade intelligence gathering and maritime security of India on western as well as eastern flanks of Indian Ocean (NASA, 2023). Moreover, this spacecraft will dependency of Indian Navy on the British Inmarsat company that previously provided various services in communication domain to Indian ships.

In December 2018, Indian Space Research Organization launched another geosynchronous communications satellite, GSAT-7A (named as Angry Bird) that is chiefly operated by IAF-Indian Air Force as well as Indian army. This spacecraft offers persistent connectivity between ground airbase, ground radar stations, and AWACS- Air borne early warning and control aircrafts like Phalcon and Beriev A-50. Resultantly, this military satellite boosts IAF's network centric capabilities and in turn its global operations. (India98). Furthermore, G-7A enhances the flexibility and operational range of present as well as future various Unmanned Aerial Vehicles that are controlled through satellites. Examples include Sea Guardian or Predator-B which possesses the ability to annihilate fortifications of adversary from long distances (Airforce Technology, 2019).

Various earth observation satellites of India have spectral and optical sensors which limit performance of satellites during cloud cover. To get rid of these observation related limitations in bad weather and during night time impeding the surveillance capabilities, Indian Space Research Organization developed multiple reconnaissance satellites termed RISAT- Radar Imaging Satellites. Falling under the category of earth observation satellites, RISAT employs SAR-Synthetic Aperture Radar technology with the ability to successfully perform in all-weather. The key event triggering the launch of first RISAT was 2008 Mumbai terror attacks, and India acquired it from its strategic ally Israel. India launched it in April 2009 and named the satellite as RISAT-2. In 2012, India launched another radar imaging satellites named RISAT-1 indigenously built by ISRO. RISAT satellites can ceaselessly carry out surveillance despite the

bad weather conditions/ cloud cover and have precise viewing capacity during day and night. The can take images with high, fine, as well as coarse resolutions (Lele, 2017). Additionally, in 2019, India launched two other RISAT termed as RISAT-2B & RISAT-2BR1 which are most advanced that their predecessor radar imaging satellites (Madhumathi, 2020). RISAT-2BR1 which is regarded as the most advanced surveillance satellite of India extremely beneficial for India's military alongside other fields like disaster management support, forestry, and agriculture. This satellite also enables the India to distinguish two close objects, even at minimal distance of 35cm (NDTV, 2019). On February 14, 2022 India launched the latest RISAT-1A/ EOS-4 which is microwave remote sensing satellite onboard PSLV C-52. This satellite also holds immense importance for defense applications as it can take images in all weather and during day and night (Rajesekhar, 2022).

Armed forces of India had always faced enormous difficulty in acquiring space-based intelligence data, which modern armed forces in the world adequately enjoys. Due to inadequate coverage inadequate for fulfilling military requirements of India, it had to purchase the imageries from remote sensing commercial companies of United States as well as Israel and others. It didn't have direct access to space-based thorough photographic imagery until 2001 when India successfully launched Indian Remote Sensing (IRS) TES-Technology Experiment Satellite (Moltz, 2011).

One of the most important part of IRS program are the dual purposes (military and civil) satellites CARTOSAT or Cartography Satellites which are optical earth observation satellites equipped with Panchromatic cameras having the ability to incessantly view over India as well as IOR. CARTOSAT series consists of the different satellites with different resolution launched in different years. India launched the first CARTOSAT named as CARTOSAT-1 and second satellite named CARTOSAT- 2 in 2005 and 2007 respectively. The resolution of both these satellites was minimal, even less than one meter. In April 2008, India launched another CARTOSAT satellite named CARTOSAT 2A (Mahajan, 2020). It is India's dedicated military satellite with 2.5 meters resolution which can be steered in order to take high frequency image of any specific area. In July 2010, India launched another satellite of the same series named CARTOSAT-2B with the ability to provide multiple spot scene imagery (Badri-Maharaj, 2019). Additionally, in June 2016, India also launched CARTOSAT-2C with 0.6 meters resolution which India also used for carrying out the surgical strikes in 2016 against Pakistan. .Other member of CARTOSAT-2 series includes CARTOSAT-2D and CARTOSAT-2E which were launched in 2017 coupled with the CARTOSAT-2F launched in 2018

(Skyrocket, 2023). ISRO has also developed the third generation CARTOSAT-3 satellites which considered as the most cutting-edge, complex, and advanced India's earth observation satellites. The MWIR-Mid wave Infrared Imager of the satellite can provide resolution of about five meters while its panchromatic imager has 25cm resolutions (Aerospace Technology, 2023).

Other multitasker satellites of India with significant military uses include Resourcesat and Oceansat which are also the earth observation satellites launched by ISRO. For ocean monitoring or ocean observing missions, India launched OceanSat-1 in 1999 and OceanSat-2 in 2009. In November 2022, ISRO launched EOS-6 (Earth Observation Satellite) also called OceanSat3 which can take measurements of ocean winds, ocean color, and surface temperatures of sea. According to the Thenmozhi Selvi, project director of ISRO for Oceansat-3 mission, the applications of the satellite includes wind velocity; weather forecasting; cyclone tracking and detection; and lastly, maritime security (Clark, 2022). India launched Resourcesat 1in 2003 and Resourcesat 2 in 2011. In 2016, Resourcesat-2A was launched replacing its predecessor Resourcesat 2 in order to dispense remote sensing data (Aerospace Technology, 2023). To continue missions of Resource-1 and Resource-2, Resourcesat-3 series, India has launched the Resourcesat-3 series with advanced earth observation and multispectral capability (skyrocket, 2023)

Signal Intelligence or SIGNIT is mainly employed to interdict signals disseminated through radars, communication systems, and electronic devices. It can categorized into three types based on typs of signals emitted: FISINT- Foreign Instrumentation Signals Intelligence, COMINT-Communication Intelligence, and ELINT- Electronic Intelligence. With respect to ELINT, India is incessantly trying to buttress its space based technologies to enhance its spying capabilities. On April 1, 2019 India launched the EMISAT, first every country's electronic intelligence satellite onboard PSLV C-45. This satellite is part of project Kautilya which aims at providing electronic ELINT-Electronic signal Intelligence through space assets. This satellite entails instrumentation for detecting, characterizing, and locating electromagnetic signals, particularly of military radars, thus enhancing the space surveillance capabilities (Dar, 2019).

India has started building another important satellite series named as Microsat which is relatively in comparison to GSAT and RISAT series. In January, 2012, India launched first satellite of the series thus kick starting the development of new satellite series. Although ISRO didn't disclose details regarding the satellite's capabilities and regarded Microsat an imaging

satellite, it contains the payload built by DRDO signifying its formation for military purposes (Karmakar, 2020).

4.9.4 SPACE LAUNCH VEHICLES AND BALLISTIC MISSILES

Civilian satellite program of India acted as a precursor to its ballistic missile program. After the formation of ISRO, scientists of India became familiar with the western rocket technology when more than 350 sounding rockets from United States, Soviet Union, France, and Britain were launched from India's space port in Thumba. Concurrently, US provided technical reports of its Scout sounding rockets which introduced scientists in ISRO with solid-rocket propulsion systems. With the ability to launch payload in low-orbit and sub-orbit configurations, Scout rockets can be transformed into short-range missiles with bounded payload. US Scout technology led India to develop its SLV-3- Space launcher which was successfully tested and launched Indian satellite in orbit (Cirincione, 1999).

Successful space program of a state is indicative of its ability to employ nuclear weapons and target any other state in the world. If the state has the capacity to send a satellite into HEO-Higher Earth Orbit, it signifies its potential to modify their space launchers or SLV-space launch vehicles to annihilate any place on earth. As far as India's SLV capacity is concerned, in 1980 it employed indigenously built SLV3 rocket to launch the country's first ever satellite. DRDO-Defense Research and Development Organization developed that rocket which stimulated the India ballistic missile program under the India's rocket scientist and former President Dr.Abdul Kalam (Linganna, 2022).

In less than ten years since first satellite launch, India harnessed the technology and knowledge from SLV3 rocket and India tested its first every Agni surface-to-surface missile (Agni I) with 700-1200km range. Furthermore, Indian space research organization built PSLV-Polar Satellite Launch Vehicle with four stages using liquid as well as solid fuel staged. This space-related success substantially galvanized the second-stage of Agni-II missile with 2000km range. Agni-II has been acclaimed for its adaptability and mobility, enabling India to reach China's southeastern and entire Pakistan. Due to India's continuous progress in space technology, India remained successful in upgrading Agni series missiles. For example Agni-III with 3500km range, Agni IV with 4000km range and most noteworthy Agni V with 55000km range depicts the improvements in this Agni missile series. India tested Agni V in 2012 which is also regarded as the Inter Continental Ballistic Missile, providing India the counterforce

capability owing to MIRV-Multiple Independently-targetable re-entry vehicles capabilities and enhanced payload (Linganna, 2022).

4.9.5 INDIA'S BALLISTIC MISSILE DEFENSE

Ballistic missile defense system comprises of missile interceptor and radars to track as well as intercept the target (ballistic missile) in endo-atmosphere and exo-atmosphere. Radars alongside satellites are used for tracking and then systems generated information is used to determine quantity of target and type of missiles to be fired. Further, that information processes through country's mission control centre for the purpose of command and then BMD missile engages the target and destroys it (Desai, 2023).

The ballistic missile defense program of a country has significant repercussions for space security; additionally, it underlies country's space policy. The unique aspect of Ballistic missile defense is its connection with outer space as states can convert their space launchers into missile interceptors. Dual nature of technology defines the relationship between BMD and space and BMD program in turn signifies the militarization of country's space program (Paracha, 2013). Additionally, the exo-atmosphere missile interceptors can further be converted into Anti-Satellite weapon. In 1999, India launched its BMD program motivated by regional security environment, notably, Nuclear tests of Pakistan in 1998 and substantial leaps of China in nuclear and missile technology. There are two phases of BMD program: Phase I & Phase II

Phase I: This phase focuses on intercepting missiles within atmosphere of earth also known as endo-atmospheric level. This phase emphasizes on missile interception up to 2000km with a key focus on missile arsenal of Pakistan. There are three components of Phase-I: a)PAD-Prithvi Air Defense; b)AAD-Advanced Air Defense; c) Swordfish RADAR.

1n 1996, India acquired Swordfish or LRTR- Long Range Tracking Radar from Israel which can detect missile launches of enemy with a range of 300km. In 2006, India completed and tested the PAD system for intercepting missile at high altitude upto 300-2000km range and 80km flight altitude. It made India fourth country in world after Russia, US, and Israel to have anti-ballistic missile system. In 2007, India successfully tested the AAD system for intercepting missile at low altitude up to 150-200km range and 30km flight altitude (Goswami, n.d.)Additionally, India also tested the Prithvi missile's naval version also known as Dhanush_ ship launched interceptor in march 2009.

Phase II: With a focus on exo-atmospheric targets, the phase-II of India's BMD is an ongoing phase consists of PDV-Prithvi Defense Vehicles with the ability to intercept missiles at 5000km range (Desai, 2023). First tested in April 2014, PDV was meant to replace PDA and engage targets at 50km altitude above atmosphere of earth; however, that test was regarded a near miss when it engaged the missile at 120km altitude (Gady, 2017). In 2017, India tested carried out PDV test, from its ship in Bay of Bengal making it comparable to THAAD missile defense system of US with the ability of missile interception at 150km altitude (CSIS, 2017). In 2019, India conducted two other PDV tests in order to enhance the altitude flight of interceptors. It conducted first test with PDV MK-II interceptor in February which although reached sub-orbital altitude buts its booster failed and it couldn't intercept the Microsat-R Indian satellite while second test in March when PDV MK-II interceptor successful destroyed Microsat-R at an altitude of 300km (Weeden, 2022)

4.9.6 MISSION SHAKTI: INDIA'S ANTI-SATELLITE TEST

As per the UNDIR-United Nations Institute for Disarmament Research, ASAT or Anti-Satellite missiles are defined as space missiles that can destroy, disable, and incapacitate civilian, military, defensive, and offensive space systems for strategic military causes. There are two types of ASAT weapons

- **Kinetic ASAT weapons**: kinetic missiles with the ability to physically hit an object in outer space seeking to shatter the target and object. Examples include drones or ballistic missiles that can detonate explosives when proximal to object to or pull out the object from its orbit. Additionally, kinetic ASAT weapon can also interfere with the passage of object or target satellites
- **Non-kinetic ASAT weapons:** Non-kinetic missiles employ different non-physical means to destroy or disable a space object. Examples are cyberattacks, blinding lasers, and frequency jamming. Such kind of methods can disable the space object without breaking them up (Kosambe, 2019).

In the context of Star Wars program of Reagan Administration, the pioneer of space program of India named Satish Dhawan said that only time will show whether Indian space activities of India would solely remain pacifist and civilian. After almost thirty years, Indian Prime Minister Narendra Modi made an announcement on March 27, 2019 that India had conducted a successful ASAT-Anti Satellite missile test and become fourth state in the entire world to do so after US, USSR, and China. Prior to this test, India had conducted another ASAT test in

February which remained unsuccessful due to missile failure after 30 seconds of flying. The mission of ASAT test is named as “Mission Shakti”, where Shakti means ‘power’ in Sanskrit language. This test is characterized by the successful launch of Indian ballistic missile in space in order to obliterate satellite of India located almost 300km above surface of Earth, in LEO. ASAT test led to kinetic destruction of Indian satellite through direct-ascent missile in only three minutes, by total impact of collision instead of explosion induced by warhead. (Set, 2019).

It is asserted that India converted the Mark-II PDV-Prithvi Defense Vehicle, a missile defense interceptor, into an anti-satellite weapon. The technological antecedents of India’s ASAT test dates back to 2006 when India established its BMD-Ballistic Missile Defense Program which in turn steered the development of basic framework for anti-satellite missile. In 2012, India successfully testes the ICBM-Inter Continental Ballistic Missile named Agni V, indicating the Indian capacity to develop ASAT missile. After the successful Agni V test, Defense Research and Development Organization of India began to demonstrate India’s willingness to formulate ASAT weapons (Set, 2019).

4.10 ANALYSIS OF INDIAN SPACE PROGRAM

The space program of India began its odyssey in 1960s which over the several decades has carried out multifaceted missions after achieving significant milestones, entailing launch of various satellites for navigation, communication, as well as remote-sensing purposes. Given the increase in geopolitical competition and altering geo-strategic milieu, a substantial increase in the development and use of military space capabilities by India has become evident. It has been harnessing satellites for reconnaissance, surveillance, and military communication. Furthermore, various projects have been authorized for formation and use of ground infrastructure, launch vehicles, and satellites for military purposes.

The key motive for development and enhancement of the space program of India, notably in military domain is to increase intelligence gathering capabilities, strategic communication, as well as situational awareness. Additionally, such technologies will enable India to track movements of troops, to monitor its volatile borders with China and Pakistan, and to intercept enemy’s channels of communication. Furthermore, the growing space capabilities will also allow it strengthen its ballistic missile defense. In the upcoming years, Indian space program is expected to become more sophisticated and larger in size that in turn have several detrimental implications for Pakistan that will be discussed in next chapter.

EVOLVING NUCLEAR AND OUTER SPACE CAPABILITIES OF PAKISTAN IN THE BACKDROP OF INDIAN COUNTERPARTS

CHAPTER V

5.1 INTRODUCTION

Pakistan was one of the first ten states that commenced the space program in the world. The space odyssey of Pakistan began in 1960s with the establishment of space research wing and later it was given a full status of space commission and agency. The landmark start is worth appraisal, however, the ever-lasting unfavorable political and economic environment in addition with regional instability, the space program of Pakistan faced brutal decline. In the initial years, Pakistan collaborated with United Stated in space domain on the Rehbar program, but then its policy diverted towards China after facing sanctions from US in 1980s and 1990s. Pakistan also announced its space vision in 2011 in order to bolster its space program and launch its satellites.

In comparison to India, Pakistan space journey started earlier than India's and was even impressive than its counterpart, but gradually India took a substantial leap, and considerably has enhanced its space capabilities in civil, commercial, and military domain in order to further the space power. Pakistan's security concerns have always been India centric given the history of wars and conventional disparity. India's lead in the military space program have furthered the threat perception of Pakistan given the detrimental Implications of India's space program. These implications includes lethal impact on nuclear deterrence in region, notably with respect to India's ballistic missile defense and counter space capabilities; threat to Pakistan's space assets, regional arms race and precarious region stability. Most importantly, Pakistan's nuclear weapons serves as a deterrence mechanism given humongous difference in both state's economic and military resources, however, India's space capabilities endows India enhanced warfighting capabilities and also gives its enhanced counterforce capabilities which can disrupt the nuclear deterrence and in turn strategic stability.

In this backdrop, this chapter will discuss a) Various phases of space program of Pakistan; b) Pakistan's stance on space weaponization; c) Pakistan's satellite program; d) Implications of

India's space quest for Pakistan. In the end, policy recommendations are also given to curb the threats emanating from India's space power pursuit.

5.2 SPACE PROGRAM OF PAKISTAN

5.2.1 PHASE I (1960-1976)

Given the burgeoning leaps in the space technology, various scientists of Pakistan cognizant of significance of outer space for development and prosperity prompted the government to establish a space organization. Resultantly, Pakistan Atomic Energy Commissions' Space Sciences Research Wing was inaugurated through Executive Order of President Ayub Khan on September 16, 1961.

The formation of SUPARCO coincide with height of space race as Cold War expedited the breakthrough in space technology. During that period, space became the theater of contestation between two superpowers-US and USSR which competed for power and prestige in scientific arena. Although Pakistan space program couldn't contest with US and USSR, but it fully reaped the benefits of super power contestation in outer space. In 1961, four preeminent scientists from SUPARCO were sent to NASA for getting space science related training (Kabir, 2019). Concurrently, US-USSR incessant race to send their respective lunar manned flight mission led former to hunt for most suitable place for atmospheric investigation. Resultantly, Indian Ocean was considered as the adequate location to study wind dynamics and other characteristics of upper atmosphere. Taking into account alliance of Pakistan with US during Cold War, Pakistan appeared to be most appropriate partner for US to cooperate in IOR-Indian Ocean Region to materialize its aim of sending its astronaut to moon before 1969 (Iqbal, 2020).

During that time, President of Pakistan General Ayub Khan was on official visit to US who pragmatically availed the opportunity and called Pakistan's engineer named Tariq Mustafa from SUPARCO to US to meet officials of NASA and conclude an agreement on space cooperation. Ergo, Pakistan became first ever state in South Asian Region to cooperate with US on outer space. The immediate consequence of this collaboration with the Rehbar series-Rehbar I and Rehbar-II, rockets probes launched by Pakistan to collect meteorological data from as well as beyond the second layer of atmosphere-Stratosphere, abetting scientists to investigate weather patterns over sea (Kabir, 2019). On June 7, 1962, Pakistan launched Rehbar-I- two stage rocket with Nike-Cajun combination (NASA built sounding rockets) from Sonmiani Rocket Range in Balochistan. Carrying a payload of sodium weighting 80 pounds,

Rehbar-I reached almost 130k into upper atmosphere, making Pakistan tenth country in entire world and third in Asian region to carry out such rocket launching. Rehbar-I was followed by launch of Rehbar-II on June 9, 1962 from the same Sonmiani Rocket range. Data collected from Rehbar series yielded details on wind shear together with structure in upper atmosphere's different layers exceeding far off Stratosphere. Moreover, the date also provided enormous help in examining weather, cyclones, and cloud formation over Arabian sea (SUPARCO, 2019). From1961-1962, the duration from signing of agreement with US to launch of Rehbar-I, Pakistan overcame tremendous technological barrier and Pakistani scientists team had been chosen and trained in US. Additionally, the instruments and equipment essential for launching rockets had also been obtained given lack of manufacturing capability to develop these indigenously at that time.(Kabir, 2019). Pakistan launched multiple rockets during 1962-1964, however, Rehabar Rehbar program ended after ten years (1972). It gave SUPARCO substantial knowledge and expertise that eventually played an indispensable part in development of ballistic missile program of Pakistan (Khan, 2012). The rockets such as Rehbar-24 were liquid propellant rockets developed on blueprint of NASA rockets, enabling Pakistan to power launch vehicles in a faster and cheaper way.

Besides Rehbar Series, NASA and Pakistan also collaborated on launching of hypersonic sounding rockets called Rukhnum and Shahpar. Former was three-stage rocket with liquid fuel that reached almost 1000km while later two-stage rocket with liquid fuel that reached 950km in atmosphere (Zafar & Zafar, 2022)

5.2.2 PHASE II (1977-1999)

The second phase of Space program of Pakistan began with the ascendance of General Zia-ul-Haq as a Chief Martial Law Administrator in 1977 and later President of Pakistan in 1978. Under his rule, it was assumed that SUPARCO wouldn't meet its developmental goals; however, the Aryabhatta satellite launch by India in 1975 gave motivation to Pakistan's leaders to devise a counter-plan against it. Correspondingly, SUPARCO was reinvigorated in 1979 and began developing PAKSAT-satellite (Zafar & Zafar, 2022). In 1980, President Zia visited SUPARCO and order to discontinue all the under way projects given the lack of funding. Nonetheless, through the President Ordinance in 1981, SUPARCO was accorded status of Commission and proclaimed as national space agency in charge of execution of country's space programs. This ordinance also led to formation of SRC-Space Research Council to devise and oversee policies for space program of Pakistan (SUPARCO, 2023). In 1984, SRC sanctioned

long-term ‘Space Science and Development Program’ consisting of four components shown in table 5.1

5.1 Components of Pakistan Space Science and Development Program

Component A	Formation of ground stations as well as ancillary facilities for ● To gather and utilize scientific data entailing earth’s imagery for carrying out natural resources surveys ● Reception and investigation of high and low frequency communications signals
Component B	Development of satellite tracking facilities, namely laser tracking stations and optical radar
Component C	Launch of satellites for various purposes such as scientific observations, TV broadcasting, and point-to-point telecommunications
Component D	Formation of satellite launch vehicles and satellites

Source: (SUPARCO, n.d.)

Although Post-Ordinance period is characterized by various institutional changes and space development program, however, soon the militarization of space program began when the focus of country shifted to development of missiles and weaponized rockets that can reach India.(paks5). As per the analysts, Pakistan’s space agency played an important part in development of solid-fueled ballistic missiles, particularly the alteration of French sounding rockets to develop short range missiles such as Hatf-1 and Hatf-2. Resultantly, in 1991 SUPARCO faced missile sanctions imposed by Bush Administration under 1979 Export Administration Act and 1976 Arms Export Control Act. In 1998, SUPARCO once again faced sanctions imposed by the Clinton Administration due to alleged involvement in missile and nuclear technology. These sanctions were later waived off in 2010 by George W. Bush administration to solicit Pakistan’s support in Global War on Terrorism after September 11 attacks (NTI, 2023). During the period of sanctions, China tremendously helped Pakistan in latter’s satellite program named as BADR program. First Experimental satellite of BADR series was launched on July 1990 through the help of China.

5.2.3 PHASE III (2000-2023)

The beginning of 20th century witnessed another institutional change with respect to SUPARCO when Order No.564 by the Cabinet Division in 2000 gave its control over SUPARCO commission to NCA-National Command Authority and replaced the SRC-Space Research Committee with NCA's DCC-Development Control Committee. In the subsequent year, Pakistan also successfully launched second satellite from Badr series, signifying the efforts towards furthering indigenous space capabilities (SUPARCO, 2023). Furthermore, Pakistan's collaboration with China in space domain led to launch of another satellite named PakSat-1R in 2011. Another important development in this time period is the 'Space Vision' of Pakistan which is described below.

Space Vision of Pakistan: In 2011, National Command Authority of Pakistan gave the country's space vision named as 'Space Program 2040' which was later renamed as 'Space Vision 2047'. As per this vision, Pakistan aims at launching five Low-Earth Orbit satellites and six Geosynchronous Equatorial Orbit Satellites (Iqbal, 2020). Then chairman of SUPARCO foregrounded mission statement of vision and declared outer space as strategic sector and laid stressed on tapping every aspect of space technology, space science, and its uses for national development coupled with national security (Muhammad, 2022). Furthermore, in 2019, Pakistan's Minister of Science and Technology Fawad Chaudhary announced that country will send its first astronaut in outer space by 2022 using the Chinese facility as per China-Pakistan already existing Agreement. However, in 2020 the same minister announced the deferment in Pakistan's manned flight programme due to insufficient economic resources and COVID pandemic (Pons, 2020).

In lei with the space Vision, Pakistan kicked off it remote sensing satellite program and launched two satellites named PRSS-1 and PakTes-1A in 2018. Other related satellites are also under development which Pakistan plans to launch in near future.

5.3 PAKISTAN'S STANCE ON SPACE WEAPONIZATION

As far as Pakistan's stance on space militarization and weaponization is concerned, it has always opposed outer space's weaponization and called international community to prevent it. Various state representatives have officially upheld this stance, to name Farukh Amil, the former Pakistan's permanent representative to United Nation affirmed before Disarmament and International Committee of UN General Assembly that Pakistan regards state as 'global

common' which shall be exploited only for peaceful purposes and socio-economic development.

Given the dual-applications of space systems, space weaponization cannot be debarred, particularly due to surge of technological innovations and advancement in domain of space. Placement of weapons in space jeopardizes international and regional peace and security. With respect to Pakistan, it staunchly oppugns weapons' placement in space due to their colossal devastating potential and simultaneously calls for disarmament measures in domain of space in accordance with 1967 Outer Space Treaty. Additionally, Pakistan advocates TCBMs-Transparency and Confidence Building Measures in outer space at multilateral as well bilateral levels to fend off miscalculations and misunderstandings related to space activities. Furthermore, it also patronized multiple declarations/resolutions on 'No first placement of weapons in space' and PAROS-Prevention of Arms Race in Outer Space treaty. In addition, Pakistan is also a staunch proponent of 'International Code of Conduct for Outer Space Activities' with non-legal binding nature coupled with other international initiatives supporting space related disarmament (Arif, 2019).

When India conducted its ASAT test in 2019, MOFA-Ministry of Foreign Affairs urgently issued statement in the wake of grave threat to Pakistan's security. It called against various space-related military threats and urged states to be responsible to refrain from actions that cause militarization of space. Furthermore, MOFA stated that states condemning exhibition of space military capabilities should be prepared for mapping out international instrument to curb space-related military threats. The firm stance on curbing militarization of space can also be determined from MOFA statement in 2019 that bragging such capabilities (with indirect reference to Anti-satellite weapons and space-military capabilities) is suggestive of titling against the windmills by Don Quixote, implying the attack on the imaginary adversaries (Reuters, 2019).

5.4 PAKISTAN'S SATELLITE PROGRAMS

5.4.1 COMMUNICATION SATELLITES

The first ever indigenously manufactured satellite of Pakistan 'BADR-I' was launched on July 16, 1990. It was an experimental satellite launched onboard Long March 2E rocket of China in the Low Earth Orbit with a mission life of one month. The second satellite of the same fleet with more advanced technology named as 'BADR-II' was successfully launched on December 10,

2001 on Zenit-2 rocket of Russia equipped with mapping and imagery instruments. Both BADR-I and BADR-II satellites systems were built using designs from space companies of United Kingdom. (Ahsan & Khan, 2019)

Given the geostrategic location of Pakistan (with ocean between equator and country's territory) and early space program, International Telecommunications Union gave five orbital slots in Geostationary Orbit; however, Pakistan remained unsuccessful in using these slots by either launching indigenously built satellites or leased purchased satellites from other states, causing the loss of four out of five space slots. In order to save the last slot, Pakistan leased Palapa-C1 satellite built by Indonesia in 2002 and was renamed as Pak-sat-1. This satellite suffered from battery problems causing gap periods and was eventually replaced by Pak-Sat1R on August 11, 2011. This satellite was developed and launched with the assistance of CGWIC-China Great Wall Industry Cooperation, intended to provide various services such as tele-education, digital television, and broadband internet for Pakistan as well as South Asia, Central Asia, East Africa, and Eastern Europe (Mehdi &Su, n.d.)

5.4.2 REMOTE SENSING SATELLITES

On April 20, 2016, Pakistan's space agency SUPARCO and CGWIC-China Great Wall Industry Cooperation penned a contract for manufacturing and launching the PRSS-1-Pakistan Remote sensing Satellite. On July 9, 2018, Pakistan launched PRSS-1 alongside another completely indigenously developed remote sensing satellite PakTES-1A from Jiuquan Satellite Centre in China from the same launch vehicle named Long March (LM-2C) (Mehdi & Su, n.d.). PRSS-1 launched into LEO is purposely developed to fulfill country's demands for high-resolution imagery demanded by users for economic and social development, primarily in fields of rural and urban development, land mapping, monitoring and management of natural disasters, environmental monitoring, water resources management, and agriculture classification as well as assessment. Additionally, Pakistan also uses PRSS-1 imagery for planning and monitoring CPEC- related gigantic infrastructure development. Furthermore, PRSS-1 will help country in identifying adequate freshwater storage sites and to carry out national afforestation campaign (SUPARCO, 2023). As far as PakTES-1A is concerned, the primary objective of launching this satellite is to enhance Pakistan's indigenous capability in development and design of different types of satellites (SUPARCO, 2023). Besides, SUPARCO has commenced PRSC-EOS- Optical remote sensing application satellite program with the aim of developing as well as launching three remote sensing satellites fitted with

optical satellite sensors. The satellites are supposed to be launched by 2023, however, the economic condition of the country might cause delay in their launch (SUPARCO, 2023).

5.5 IMPLICATIONS OF INDIA'S SPACE PROGRAM FOR PAKISTAN

5.5.1 INDIA'S ENHANCED DETERRENCE-CUM-WAR FIGHTING ABILITY AND ALERT REGARDING ENEMY'S WAR STRATEGY

Space capabilities of India can play an indispensable role in increasing India's warfighting capabilities, its deterrence vis-à-vis Pakistan, and can provide it alert regarding war strategy of adversary as shown in table 5.1 below.

5.2 India space capabilities and enhanced military capabilities

Space assets	**Domain**	**India's capabilities**	**Role in Military operations**
a) Space systems that amplify war fighting capability	i. Imagery	● RISAT series, CARTOSAT series; Ocean; Microsat	● Aids in identifying various targets
	ii. Meteorology	● INSAT series; previously Kalpana satellite & ScatSsat-1	● Weather data helps in planning reconnaissance; special operations; and military operations
	iii. Signal Intelligence	● EMISAT-satellite (Project Kautilya)	● Essential for detecting signals, entailing broadcasting signals ● To gauge intentions of adversary as well as his tactical moves

	iv. C4ISR	● CARTOSAT series; RISAT series; Resourcesat-3; EOS-6; GSAT & GSAT-7A	● Space systems act as C4ISR enabler for army, air force, and navy for command and control & communication networking
	v. Navigation & Targeting	● IRNSS-Indian Regional Navigation Satellite system	● Target location ● Precise maneuvering coupled with weapon launch on adversary's strategic tactical assets and positions
b) Space systems that provide capability to deter enemy	i. SSA-Space Situational Awareness	● Constellation of various satellites and radars	● Knowledge of location and functions of space assets of one's own and of adversary's
	ii. Offensive Space	● ASAT Weapon Test (Mission Shakti)	● Anti-satellite weapons to annihilate adversary's satellites
	iii. Satellite assisted BMD-Ballistic Missile	● Phase I: PAD; AAD; Swordfish Radar	● Missile interception in exo and endo-atmosphere

	Defense	● Phase II: PDV	● Ensures homeland defense ● Endows second-strike capability
c) Space systems that war or alert regarding war fighting strategy of enemy	i. Early Warning	● Geostationary satellites can be used	● Spotting missile launches through infrared satellite sensors

Source: (Sharma, 2016); (Parliamentary Office of Science and Technology, 2006); (Curtis. E. Lemay Centre, 2021).

5.5.2 IMPACT ON NUCLEAR DETERRENCE AND STRATEGIC STABILITY

When it comes to security of the state, the defense capabiliies in whatsoever domain go hand in hand. Most importantly, the space military technologies are intrinisically linked to the nuclear capabilities of state that in turn has direct impact on the nuclear posture. Furthermore, the securitization of the outer space and India's relentless purusit to become a space power has compelled its policy makers and military of the state to enlarge and advance the military space capabilities of India. This not only creates colossal gap in India and Pakistan outer space capabilities but also is detrimental for the nuclear deterrence between India and Pakistan as space.

a. **Space systems and efficiency of India's Ballistic Missile defense:** The space aspirations of India poses enormous security threats to Pakistan given the former's burgeoning space capabilities in war fighting domain and latter's nascent space capabilities. While keeping into consideration, India's fleet of remote sensing satellites (as discussed in chapter III) in Low Earth Orbit are a source of regional instability.

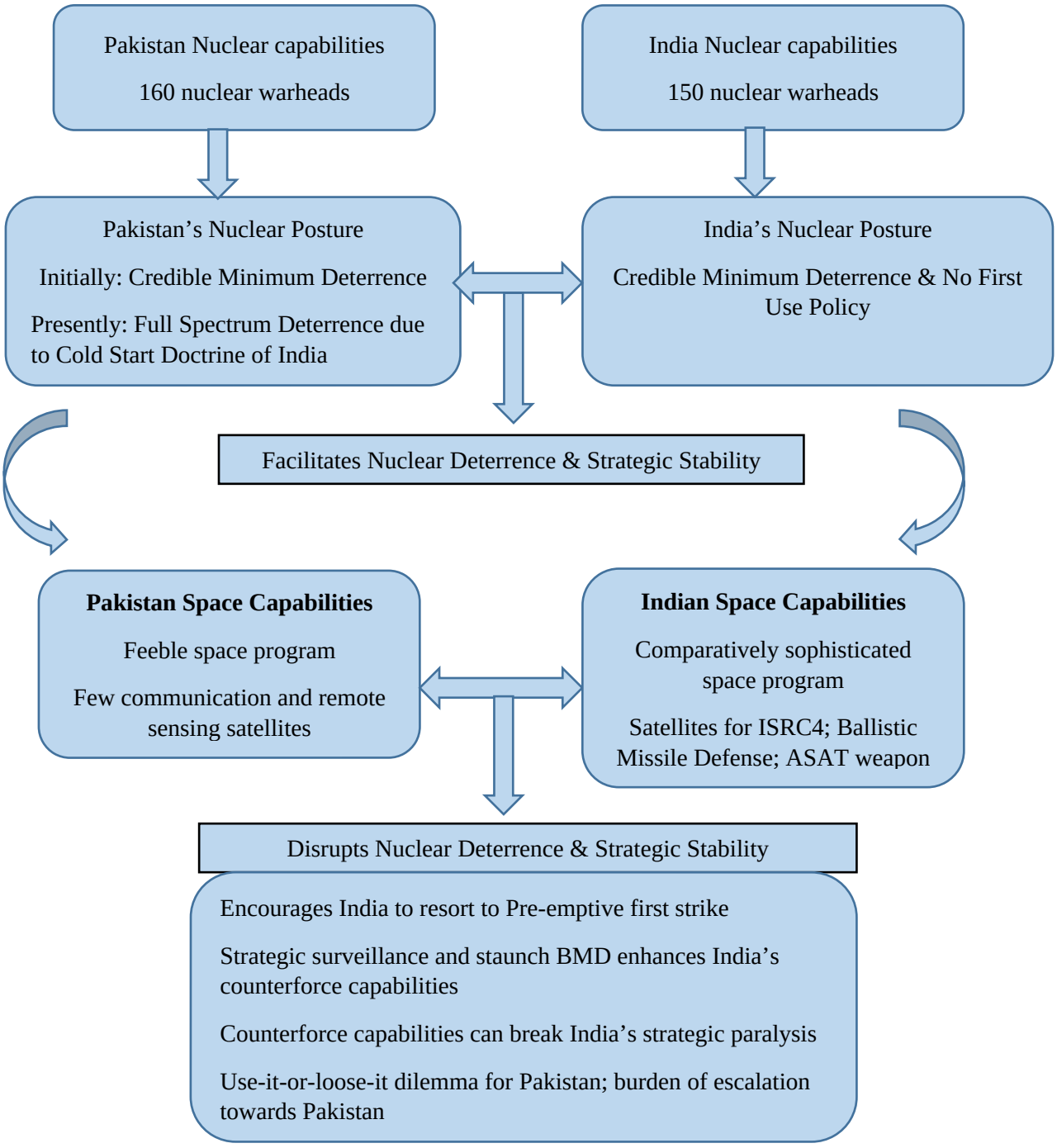
Furthermore, Ballistic Missile Defense (BMD) system (discussed in chapter III) of India is facilitated by these satellites making it more robust and proficient. The higher functionality of India's BMD system is directly proportional to second-strike capability owing to high survival rate of nuclear arsenals. This BMD-space satellite nexus in turn enhances the probability of war in the region.

ISR or Intelligence, Surveillance, and Reconnaissance capabilities of state are considered as a pre-condition in order to envisage first nuclear strike. Space-based systems are indispensable for dispensing the reliable and precise early information and ISR data at critical times, especially when other military assets become inefficient. In this regard, India is relentlessly enhancing its constellation of remote sensing, navigational, and communication satellites that in turn will further target acquisition capability of India. Likewise, Indian military satellites such as GSAT-7 endows it with the C3- capability (Command, Control, and Communications) that would buttress the launch of country's ballistic missiles in war case scenario. Resultantly, it would enhance confidence of India with respect to high-capability of Ballistic Missile Defense System in detection of adversary's (Pakistan) incoming missile in case of conflict. It further would encourage India to resort to pre-emptive strike against Pakistan due to its advantageous position comparable to latter ((Bano, 2021).

Ballistic Missile Defense Shield of India with the capability to intercept missile at both exo-atmospheric level and endo-atmospheric level threatens the deterrence equation of Pakistan and encouraged state response in accordance with action-reaction syndrome affixed with the strategic environment of South Asia. Resultantly, Pakistan successfully tested Ababeel Ballistic missile (a MIRV-Multiple Independently Targetable Re-entry Vehicle) to counter the Ballistic Missile Shield Program of India. Consequently, it has led to the initiation of missile arm race in region which will not remain confined to merely missile arena nay could start in domain of nuclear fissile material. Furthermore, the command and control apparatus of Pakistan can face severe nervousness due to BMD shield; additionally, it can enhance the war-related uncertainty and fog of war. Furthermore, it can lower the lower threshold and enhance the chances of nuclear brinkmanship. It could not only incentivize India to launch pre-emptive strikes against Pakistan in unconventional as well as conventional terms, but could also cause the military planners of Pakistan to downgrade their restrained approach and resort to nuclear preventive strike (Minhas & Shujahi, 2017).

The figure 5.1 underlies the link between nuclear and space capabilities of India and Pakistan and depicts its impact on the nuclear deterrence. It signifies how the mammoth gap between both state's space capabilities not only threatens the space capabilities of Pakistan nay is detrimental for the nuclear equation between both arch rivals.

Figure 5.1: Nexus between Indo-Pak Nuclear & Space capabilities and Impact on Nuclear Deterrence



Source: Made by author, Data retrieved from (Centre for Arms Control and Nuclear Non-Proliferation, 2023); (Khan, 2022)

b. **Enhanced Counterforce capabilities of India:** Dedicated military satellites for surveillance and reconnaissance can provide the capability to acquire daily coverage of military installations of Pakistan, thus providing it better counterforce capability. The term counterforce refers to targeting the military nuclear forces of adversary which is difficult to carry as opponents such targets may be hidden, numerous, and well-protected. With the progression of satellite-based communication and reconnaissance capabilities, nuclear deterrent of Pakistan would become endangered to first strike of India (Mistry, 2001).

Space-based assets providing the ISR would magnify counterforce capabilities of India vis-à-vis Pakistan. Similarly it will dispense Command and Control centers of India with discernable and quantifiable data. Resultantly, the burgeoning space capabilities of India with strengthen its Nuclear Command and Control (NC2) and in turn provide it more freedom in decision making. Consequently, security dilemma will severely undermine the nuclear deterrence equation in South Asia incentivizing India to opt for counter-force pre-emptive strike against its arch enemy Pakistan. ISR capability acquired through constellation of space assets places India at an advantageous position vis-à-vis Pakistan. To further aggravate the situation, the fusion of technical abilities and advantages furnished by space-based Intelligence, Surveillance, and Reconnaissance endows state the ability named F2T2EA-Fix, Track, Target, Engage, and Assess, providing both precis data as well as target to carry out an attack (Bano, 2020).

Enhanced target identification capacity will tempt India to carry out a surprise first strike against Pakistan. Resultantly, it will compel Pakistan to either enlarge its nuclear arsenal or espouse higher alert levels. Similarly, if India resorts to nuclear first-strike strategy buttressed by sophisticated space-based capabilities, it will create a use-it-or-lose-it dilemma for Pakistan. Furthermore, access to such military offensive capabilities will likely support adoption of offensive military doctrines and aggressive political posture by India. Conversely, Pakistan will remain reliant on nuclear deterrent until the development of its own sophisticated space systems and capabilities. Besides, continuous development of space assets of India will further its conventional military advantage vis-à-vis Pakistan. For instance, 2018 Land Warfare doctrine of India lays stress on effective utilization and expansion of space-based assets in order to buttress conventional deterrent of India against its enemies. This documents indicates India’s

evolving strategies and tactics to carry out limited military operation on territory of adversary, and for that purpose space-based ISR capability is indispensable. This in turn would enhance the chances of nuclear brinkmanship as noticeable from Kargil war (Khan & Imam, 2019).

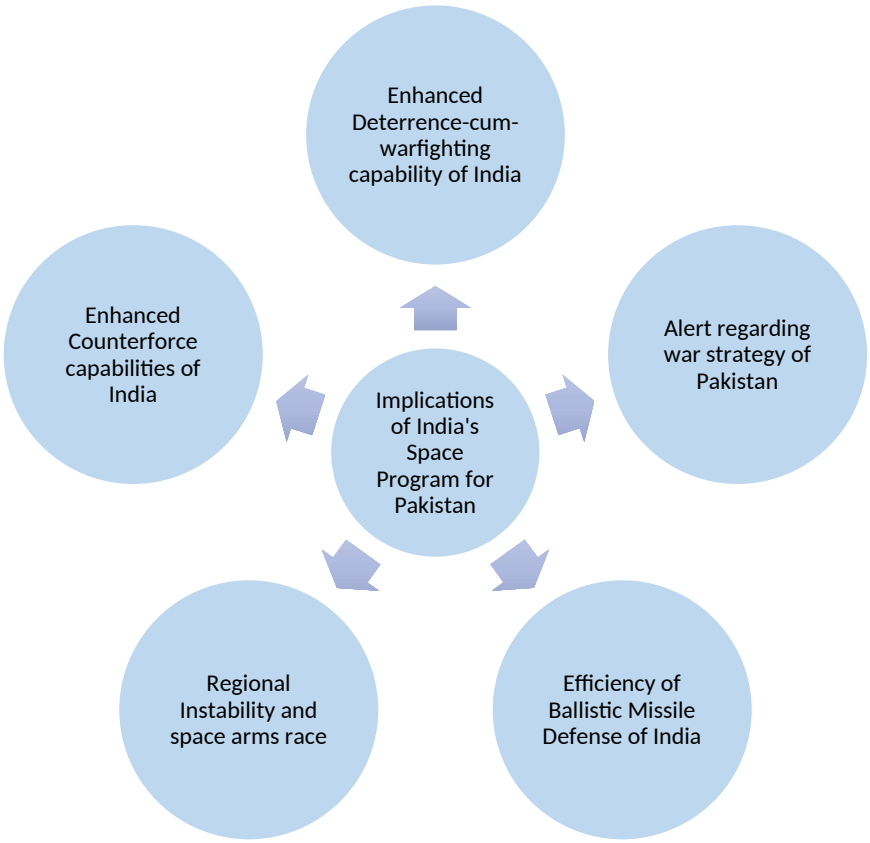
As per the conventional wisdom, India is nuclear power with restrained nuclear weapons against the nuclear warfighting and follows the No First Use Policy. However, in practical terms, there is less certainty in India's restrained nuclear posture, evident from various official statements and development of array of capabilities favoring the counter force and preemption that are contrary to India's professed strategy of minimum deterrence or assured retaliation (Clary & Narang, 2019).Staunch counter force options are signified from better surveillance, precise delivery vehicles, flexible nuclear command and structure, interception (capabilities) of strategic assets of Pakistan with the aims of neutralizing nuclear capabilities of Pakistan would break India's strategic paralysis and in turn provide it free end to wage conventional war (limited in nature) in the absence of any fear pertaining to threat of nuclear use by Pakistan (Akhtar, 2020).

The shift in Pakistan's nuclear doctrine from Credible Minimum Deterrence- small nuclear arsenal credible enough to deter an enemy from changing status quo- to Full-Spectrum Deterrence- development of tactical nuclear weapons to deter threats along the spectrum, from-sub conventional to nuclear- in the wake of India's Cold Start Doctrine to effectively deter India's conventional superiority and maintain nuclear deterrence (Faraz, 2022). India's advanced satellite system facilitating strategic surveillance and reconnaissance coupled with Ballistic Missile Defense signifies India's ever-enhancing counter-force capability, undermining the nuclear posture of Pakistan.

Through its fleet of intelligence and remote sensing satellites also provides India the ability to keep track of mobility of strategic forces. The Cold Start doctrine is grounded on the seizing limited territory of Pakistan, primarily in its Punjab province. In this regard, the possible response of Pakistan can be the use Tactical Nuclear Weapons. However, the incessant regional surveillance provides India critical data to strike those TNW (Nasr) in a conflictual situation. Indian side already claims their knowledge of placement of Pakistan's tactical nuclear weapons in garrisons proximal to India-

Pakistan International border. (Bhat, 2018). Furthermore, India's development of Brahmos missile (delivery systems with first strike potential), could embolden it to carry out preemptive strike against TNW to overcome the strategic paralysis and engage in limited conventional war with arch enemy Pakistan. India's preemptive strike against the Hatf would also shift the burden of escalation towards Pakistan as it would be left with two option: either to stood down or choose escalation. If it resorts to first choice, India would get the desired strategic advantage; and if Pakistan chooses the second option by releasing nuclear missiles, Indian Ballistic missile defense aided by its geostationary satellites would detect the missile launch. After Indian pre-emptive strike, if Pakistan choose to carry out counter-value strike, Indian satellites are also indispensable in this regard. As far as sea-based nuclear strike (second strike) options are concerned, the diesel-electric submarine which Pakistan possesses are vulnerable to satellite-based detection as they come to surface to recharge their batteries. (Shah, 2023).

Figure 5.2: Implications of India's space program for Pakistan



Source: Made by author

5.5.3 PRECARIOUS REGIONAL STABILITY AND EXPENSIVE REGIONAL ARMS RACE

Another prospective outcome of India's pursuit of space power, primarily the military space capabilities can be provocation of regional arms race that in turn can undermine the fragile strategic balance in region (Bano, 2020). Ever-enhancing space capabilities of India can cause Pakistan to assess its own capabilities and take counter-measures to ensure its own security.

South Asian region is marked by history of war and strangled relations of regional states, compelling them for arms buildup and sophistication. The pursuit of India for international prestige and great power status coupled with economic competition and political environment in region and international level has led India to develop its space program. Primarily, it was civilian in nature; however, the militarization of its space program, particularly the development of Anti-satellite weapon will kick off the unnecessary and new arms race. This militarization would cost both the countries in strategic and economic terms given its lethal and exorbitant nature. Potential space arms will plunge both India and Pakistan towards economic oblivion, strategic instability, less security assurance, and weak deterrence in region (Hussain & Ahmed, 2019).

South Asian region has always been a center of strategic dilemma, focusing on relations between India and Pakistan. The incessant attempts of India to pursue power at international level and acquire regional policeman's status would destabilize the region. Given the ever-lasting Strategic chain reaction in South Asia, India's space militarization would persuade Pakistan to take conventional and non-conventional countermeasures. Concurrently, the addition of war theater in space alongside conventional and nuclear domain will disrupt the regional strategic stability (Hussain & Ahmed, 2019).

5.5.4 THREAT TO PAKISTAN'S SPACE ASSETS

With respect to India's anti-satellite capability, it can possibly target strategic satellites used for navigation, strategic communication, intelligence, surveillance, and guidance purposes. Furthermore, any attack on strategic satellites might be framed and presented as accident (as even in case of missile attack) with the potential to panic Pakistan's strategic command. Furthermore, the offensive space capabilities of India, particularly ASAT weapons, can threaten Pakistan's space vision as well as China-Pakistan space endeavors.

CONCLUSION AND RECOMMENDATIONS

CHAPTER VI

6.1 SUMMARY

Securitization of Outer Space has become a palpable phenomenon given the framing of access to outer space critical for national security of the states in 21st century. Copenhagen School delineates securitization as the significant process through which an issue metamorphoses into a critical issue of security. The treatment of such an issue as a matter of national security concern, it becomes admissible to employ extraordinary political measures in order to deal with it. The intersubjective establishment of threats having existential nature is central in the securitization process. As far as outer space is concerned, it has become an increasingly securitized domain evident from the swift propagation of securitizing moves, delineating space as indispensable for national survival and security in different ways. It is significant to note that outer space's securitization is not new development of phenomenon. The extent of applications of space and their driving forces coupled with the substantial emphasis on space's national security functions in the past, notably the space race between USSR and US, served as foundational basis of securitization of space and use of space for direct military purposes. Furthermore, the launch of Sputnik- artificial satellite by USSR in 1957 and subsequent pursuit of space technologies by both states, and declaring such technologies as existential threats depicts the origin of space's securitization. In the 21st century, more states have become a part of this securitization process such as China, and Japan. The space security policies, space forces, and development of space military capabilities of US, Russia, China, and Japan are illustrative of ever-enhancing outer space's securitization.

Space has become a fourth domain of warfare and an arena of securitization which raises the question of law governing the behavior of states with respect to space. International space is indispensable in this regard which includes charter, treaties, agreements, and convention which restricts the conduct of spaces and limits the use of space for military purposes. 1967 Outer Space acts the as the foundational base of International Space law which regards space as province of mankind and simultaneously emphasizes on the peaceful uses of outer space. The notable space law entails United Nations Charter, Partial Test Ban Treaty, Outer Space Treaty, Rescue Agreement, Liability Convention, Anti-Ballistic Missile Treaty, Registration Convention, Environmental Modification Agreement, PAROS treaty, PPWT treaty proposal, and EU code of conduct for outer space. Despite the presence of such large number of

agreements and treaties related to space, none of them explicitly forbids the use of outer space for military purposes, except the prohibition of nuclear weapons or weapons of mass destruction in outer space as well as exclusive use of celestial bodies and Moon for peaceful purposes. That in turn is due to existing lacunas in International space law and lack of commitment by the states to limit the military use of outer space, thus playing a minimal role in curbing the arms race and securitization of outer space.

Space program and development of space capabilities in civil, commercial, and military domain are not merely limited to major powers, rather have long been proliferated to other regions, notably South Asia. India, being a key South Asian state has been pursuing mammoth space program since the formation of its space agency ISRO-Indian Space Research Organization in 1969. Although India's space program initially was purely civilian in nature, however, gradually it acquired the military aspect as well evident from the development of various dual-purpose satellites, anti-satellite weapons, space-launchers, and connection of outer space with its ballistic missile defense. Geo-political environment, nationalism, and entrepreneurship remain the primary drivers of country's space program, causing it to accrue the space power. India has no formal space policy, but there are various official statements that signify India's viewpoint with respect to outer space. India maintain its position against weaponization of space and simultaneously develops the military space capabilities. India's space capabilities are categorized into civil, commercial and military. The civil space capabilities includes Mars Orbiter Mission, India's lunar mission, and various satellites for civilian uses while the commercial space capabilities entails the privatization of space sector and development of institutions in this regard. Most importantly, the military space capabilities of India includes India's navigation system, institutional developments (formation of institutions for developing space related capabilities and averting threats, satellites for military purposes, space launch vehicles and ballistic missiles, India's ballistic missile defense, and mission Shakti-India's anti-satellite test. All these developments signify India's relentless struggle to become a space power.

India's pursuit of space power has detrimental repercussions for Pakistan. There is potent difference between the space programs of India and Pakistan. Although Pakistan's space program kicked off before India's but gradually it suffered decline and lagged behind the India's. Space program of Pakistan is based on the three phases. Phase I (1960-1976)-characterized by cooperation with USA and launch of Rehbar program; Phase II (1977-1999)-characterized by cooperation with China regarding Badr satellite series and gradual decline of

space program ; and Phase III (2000-2023) -marked by launch of Pak-Sat and other remote sensing satellites and space vision of country. Given the already conventional military disadvantage, humongous different in India-Pakistan space capabilities, and impact of India's space capabilities on nuclear deterrence, Pakistan faces several detrimental repercussions from India's space power pursuit. These includes India's enhanced deterrence-cum-war fighting ability and alert regarding enemy's war strategy; impact on nuclear deterrence and strategic stability due to enhanced counterforce capabilities, efficient ballistic missile defense; precarious regional stability and expensive regional arms race as well as threat to Pakistan's space assets. This necessitates need for space policy , space collaborations, enhancing space military capabilities , enhancing ISR satellite capability, and diplomatic efforts on the part of Pakistan.

6.2 FINDINGS

Outer Space has become an increasingly securitized domain given the immense significance of outer space for ensuring the national security of state. Various states such as US, China, Russia, and Japan have a prominent role in this securitization which is evident from their space security policies and development of sophisticated and advanced space technologies, notably in military domain. The access to outer space, its immense significance with respect to national security and rising threat perception of states given the development of space military technologies signifies the outer space's securitization. The effects of this securitization is not limited to major power nay have been visible in other regions, notably South Asia. India, a key South Asian state has been incessantly trying to become a space power through development of its space capabilities. However, the space program of India has been shifted primarily to the development of military space capabilities. These developments have security implications for Pakistan which has feeble space program and has military disparity with its arch rival India. To begin with, space military capabilities of India would enhance its war fighting capabilities and tilt the deterrence equation towards India. Furthermore it would enable it to get alert regarding war strategy of adversary Pakistan in scenario of conflict. Additionally, India's pursuit of space power has detrimental implications for nuclear deterrence and strategic stability as the space military capabilities will endow it with preemptive first strike capabilities, enhance its ballistic missile defense and enrich its counter space capabilities. Simultaneously, it will create use-it-or-loose it dilemma for Pakistan and tilt the burden of escalation towards Pakistan; furthermore, the ability of India to neutralize Pakistan's nuclear capabilities would in turn break India's strategic paralysis, thus allowing it to wage conventional warfare under nuclear threshold.

Moreover, India's space military capabilities will destabilize the region and will provoke arms race in space domain which Pakistan is unable to afford. Lastly, lethal space capabilities of India, notably the ASAT weapon threatens the space assets of Pakistan.

6.3 POLICY RECOMMENDATIONS FOR PAKISTAN

- **NEED FOR SPACE POLICY**

An all-encompassing policy framework is paramount in harnessing the national resources in an adequate manner and in developing the capabilities of state for social-cum-economic development and most importantly to curb the threat in the given domain. Pakistan doesn't have any space policy and legislative mechanism with respect to outer space. Hence it is paramount for Pakistan to devise National Space Policy, fulfilling Pakistan's space-related requirements commensurate with its national interests and security. It shall adequately set goals for short-term and long-term projects; besides, it should promote Space Culture through policy and institutional mechanism.

- **SPACE COLLABORATIONS**

Given the vast significance of outer space in security, commercial, and technological development, it is imperative for Pakistan to expand its spectrum of collaboration in space domain. Such kind of bilateral and multilateral cooperation are not only significant for boosting the commercial space programs but also enhances the diplomatic clout of country. For example, India's ever-enhancing space cooperation across the world is buttressing its commercial space program and simultaneously depending its diplomatic relations with respective states. Pakistan needs to maintain a balance in military and non-military space related development and shall fully exploit the civilian and commercial space related opportunities and cooperation. In this regard, Pakistan shall provide a conducive environment for space entrepreneurship through proper policy making and developing agency to facilitate government-private partnership or private investment in the country's space sector.

- **ENHANCING SPACE MILITARY CAPABILITIES**

Hard Kill Weapons: Hard-kill space weapons such as Anti-satellites capability can be expensive and long-term project. Pakistan can develop such weapons in future, through collaboration with China who already possesses the anti-satellite capability since 2007. Furthermore, Pakistan may develop advanced cruise missiles coupled with MIRVS (like ababeel) that can undermine the Ballistic Missile Defense system of India.

Soft Kill Weapons: Soft kill space weapons entails Direct Energy Weapons (e.g. lasers) and electronic-warfare measures (e.g. cyber-attacks and jamming). Pakistan shall focus on such disruptive technologies that can be development in a relatively shorter timer period and are less expensive as compare to hard-kill weapons. Satellite blinding lasers have the ability to damage the satellite's sensors and can either dazzle their cameras or blind them permanently. Furthermore, cyber-attacks on satellites can compromise ground-based systems, hack in-orbit satellites and jam signals of satellites in a conflictual situation to undermine space-based precision targeting, satellite imagery for military operations, and military communication during conflictual situation.

- **ENHANCING ISR SATELLITE CAPABILITY**

Indian satellites providing the ISR are essential for target identification and hitting capability during military operations. Pakistan shall also develop either indigenously or through collaboration such imaging and remote sensing satellites to have a knowledge of enemy's assets, targets, and troop movement during a conflictual situation.

- **DIPLOMATIC EFFORTS**

At diplomatic front, Pakistan shouldn't stop urging international community in addressing the space-related threats and arms race. It shall further the cause of various international agreements such as Proposed Prevention of Arms race in Outer Space, 1979 Moon Agreement, and 1972 liability convention (described in chapter III). Given Pakistan's space vision and development of satellites, Pakistan shall draw red lines with respect to militarization of space for protecting its space assets and deterring its enemy.

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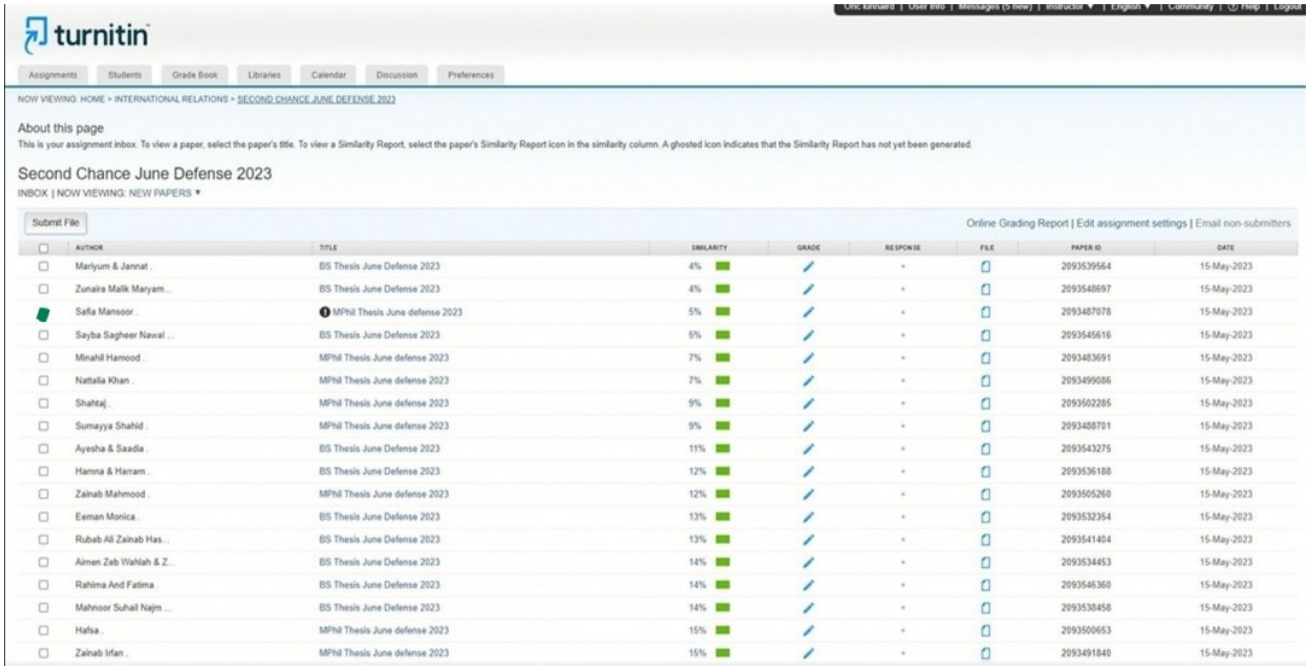

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